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for the
District of Columbia Circuit

TRANSCRIPT OF RECORD

BRIEF FOR APPELLANT

IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA

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COURT OF APPEALS
DISTRICT OF COLUMBIA
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Appeal No. 8220

937

THE MATHIESON ALKALI WORKS, INC.,
Appellant,

vs.

LUIGI ACHILLE,
Appellee.

Appeal from the District Court of the United States for the District of Columbia

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IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA

No. 8220

The Mathieson Alkali Works, Inc.,
Appellant,
vs.
Luigi Achille,
Appellee.

BRIEF FOR APPELLANT

Jurisdictional Statement

The appellant filed its complaint in the District Court (Appellant's App. 2-7), as assignee of an application for a patent on a new and useful process for producing alkali metal sulphides, said application having been filed February 4, 1936 by George L. Cunningham, against appellee, a resident of Italy, as assignee of an application for a patent on the same subject matter filed April 15, 1936 by Enzo Lanzetti. Appellant prayed for a decree adjudging said Cunningham to be the first inventor of said process and authorizing and directing the Commissioner of Patents to issue a patent for said process, to plaintiff, on the Cunningham application.

The action in the District Court was brought under Section 4915, R. S.; Title 35, Sec. 63, U. S. Code; jurisdiction of the Court below being based thereupon and upon Title 35, Sec. 72a, U. S. Code. The jurisdiction of this Court is based upon the act of February 9, 1893, c. 74, 27 Stat. 435, as amended and as incorporated in the District of Columbia Code, 1940 Edition, Title 17, Sec. 101.

Appellee in his answer (Appellant's App. 8-10) denied that Cunningham was entitled to be adjudged the first inventor of the process in controversy and alleged that appellant was not entitled to a patent for this reason.[1]

The Court below, in an opinion by Justice Bailey (Appellant's App. 13-14), held that Cunningham was not entitled to be adjudged the first inventor of the subject matter in controversy and, in a final decree entered December 9, 1941, dismissed appellant's complaint (Appellant's App. 16). The Findings and Conclusions of the District Court appear in Appellant's Appendix at pages 14 and 15.

Appellant filed its notice of appeal to this Court on January 8, 1942 (Appellant's App. 17). Appellee filed no cross appeal.

Statement of Case

Cunningham application Serial No. 62,308, filed February 4, 1936 (Appellant's App. 72-82) and Lanzetti application Serial No. 74,592, filed April 15, 1936 (Appellant's App. 104-111) were co-pending in the United States Patent Office. Both described a method of producing an alkali metal sulphide (e.g., sodium sulphide) by reacting an alkali metal amalgam (e.g., sodium amalgam) with an aqueous solution of the corresponding alkali metal *poly*sulphide (e.g., an aqueous solution of sodium *poly*sulphide).[2]

While these applications both were pending, the Commissioner of Patents declared an interference between them to determine priority with respect to this process (Appellant's App. 15, Finding #7). The interference issue was set forth in the declaration (Appellant's App. 261-263) in three counts numbered 1, 2 and 3 which are identical, respectively, with claims 12, 13 and 14 of the Cunningham application. These same counts are reproduced in appellant's complaint (Appellant's App. 5). They define the invention for which appellant seeks a patent. They read as follows:

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[1] By way of counterclaim or cross-complaint (Appellant's App. 10-12) appellee charged appellant with infringement and asked for a declaratory judgment and for an injunction and an accounting for damages. In a supplemental decree entered January 8, 1942, the Court below dismissed appellee's cross-complaint and counterclaim (Appellant's App. 16) and appellee has not appealed.

[2] Appellant's App. 15—Findings #5 and #6.

> 1. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulphide.
>
> 2. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal sulphide and sulphur.
>
> 3. The process of producing an alkali metal sulphide which comprises reacting an alkali metal amalgam containing a fraction of 1% of the alkali metal with an aqueous solution of the corresponding alkali metal polysulphide.

The invention broadly definied in count 1 is generic.* Thorough searches of the chemical literature both by Cunningham and by Lanzetti revealed no mention of the reaction involved (Appellant's App. 205, 320) and the broad novelty is conceded by the Patent Office tribunals.

The preliminary statement of Lanzetti (Appellant's App. 268-270) asserted that introduction of the invention into the United States by Lanzetti occurred on April 15, 1936, concurrently with the filing of his United States application. Accordingly, if consideration had been limited to activities in this country, it would have been necessary to

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*Count 2 differs from count 1 in that count 2 recites reacting the alkali metal amalgam with "an aqueous solution of the corresponding alkali metal *sulphide* and *sulphur*" instead of "an aqueous solution of the corresponding alkali metal *poly*sulphide," but these two definitions in reality describe the same reaction because *sulphur* merely dissolves in an aqueous solution of the *sulphide* to produce an aqueous solution of the *poly*sulphide (Appellant's App. 30, 121). The only significance as to the limitation of the percentage of alkali metal in the alkali metal amalgam, which appears in count 3 but not in count 1, lies in the fact that the amalgam remains in a fluid state so that it can be readily handled so long as the percentage of alkali does not exceed about 1% (Appellant's App. 125, 154).

award priority to Cunningham on the basis of his earlier filing date alone. However, Lanzetti filed a motion to shift the burden of proof (Appellant's App. 271-272) based upon an Italian application filed by Lanzetti on June 15, 1935 relying upon Section 4887 R. S.; U. S. Code, Title 35, Sec. 32. The only documents filed in support of the Lanzetti motion appear in Appellant's Appendix in English at pages 272-277 and in Italian at pages 279-285. These documents comprise a certified copy of the *eventual Italian patent* granted to Lanzetti and a translation thereof.

This motion was granted by the Examiner (Appellant's App. 287-288) and the granting thereof was affirmed by the Patent Office Board of Appeals (Appellant's App. 311) over opposition by Cunningham. Cunningham's opposition was based on the ground that Lanzetti failed to submit proper proof that the invention in controversy was disclosed in his Italian application *as of its filing date.*

Thereafter, in the manner prescribed by the rules of practice in the Patent Office, proofs were submitted on behalf of Cunningham in support of the allegations set forth in his preliminary statement. These proofs consisted of testimony by Cunningham in his own behalf (Appellant's App. 119-141), corroborative testimony by Cunningham's immediate superior, Maurice Craig Taylor (Appellant's App. 141-148), further corroborative testimony by Taylor's superior, Ralph E. Gage (Appellant's App. 151-158), still further corroborative testimony by Robert B. Wittenberg (Appellant's App. 149-151), and twenty-seven contemporaneous documentary exhibits herein identified as Plaintiff's Exhs. E-1 to E-27, inclusive (Appellant's App. 161-260).

No proofs were taken in the Patent Office interference proceeding on behalf of Lanzetti.*

On this record the Board of Appeals for the Patent Office awarded priority to Lanzetti, although it acknowledged that the evidence established conception by Cunningham before any date to which Lanzetti was entitled.

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*In view of the facts alleged in Lanzetti's preliminary statement proof of these allegations would have been of no benefit to him, as was pointed out in a decision of the Examiner of Interferences (Appellant's App. 297-299) and in a subsequent decision of the Commissioner of Patents (Appellant's App. 301-302).

At the trial of this case before the District Court, Taylor was recalled (Appellant's App. 27-41) to testify more specifically concerning facts corroborating Cunningham's testimony as to his reduction to practice in the spring of 1935, and to explain, as an expert, the significance of some of the data recorded in Cunningham's notebook entries.

Also at the trial of this case there was placed in evidence a stipulation (Appellant's App. 315-325) concerning testimony Lanzetti would give if called as a witness, which further corroborates the testimony of Cunningham (1) as to the occurrence of certain unusual phenomena, later to be described, when sodium polysulphide is admixed with sodium amalgam containing varying amounts of sodium and (2) as to the complete absence in the chemical literature of any mention of the reaction here involved.

Chronology of Activities by Cunningham and His Associates and The Evidence with Respect Thereto

For convenience of consideration, the activities of Cunningham material to priority may be divided into two categories; namely, (1) those prior to June 15, 1935 (Lanzetti's Italian filing date) which is the earliest date to which Lanzetti is entitled in any event, and (2) those subsequent to June 15, 1935. Cunningham, testifying as a witness in his own behalf, described the sequence of his activities material to the present controversy starting with a preliminary experiment in the latter part of July, 1934, and continuing through to the filing of his application in February, 1936.

Activities Prior to June 15, 1935

Late in July, 1934, in the course of exploratory work in part directed to discovery of a method of producing sodium sulphide from sodium amalgam and sulphur, Cunningham carried out a number of preliminary experiments. In one of these experiments he used a sodium sulphide solution as a solvent for the sulphur and noted that he obtained a fast reaction (Appellant's App. 120). In his regular laboratory notebook #15 on page 43 he made a record of this experiment at the time that the experiment was carried out (Appellant's App. 120, 161).

From his observations of this reaction Cunningham concluded tentatively that the experiments indicated that the sulphur had dissolved in the sodium sulphide to form sodium *poly*sulphide, and that the sodium amalgam then had reduced the sodium *poly*sulphide to form additional sodium sulphide.* Accordingly, in his regular monthly progress report for the month of July, covering work on various research projects during the month, he reported:

> "In addition to the above, a few preliminary experiments indicate that sodium amalgam will reduce sodium polysulfide to sodium sulfide" (Plaintiff's Exh. E-2, Appellant's App. 163, 164).

Copies of this progress report were promptly transmitted to a number of appellant's employees, including Cunningham's immediate superior Taylor (Appellant's App. 143) and Taylor's immediate superior Gage (Appellant's App. 152-153).

In the following month, August, 1934, Cunningham separately prepared a sodium *poly*sulphide solution by dissolving sulphur in a solution of sodium *sulphide.* He also prepared sodium amalgam by dissolving metallic sodium in mercury. He then added the sodium amalgam to the red *poly*sulphide solution and noted that the latter solution turned yellow. This time Cunningham made an analysis of the final yellow solution and thereby established the fact that at least a considerable part of the sodium, from the amalgam, had reacted with the excess sulphur con-

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*In the following portions of this brief we will refer to *sodium* amalgam, *sodium* sulphide and *sodium* polysulphide to avoid the inconvenience of repeating the expressions "corresponding alkali metal sulphide" and "corresponding alkali metal polysulphide". Sodium is commercially the most prominent of the alkali metals, and moreover all of Cunningham's work early enough to be material in the present controversy was concerned with sodium.

tained in the sodium *poly*sulphide to produce *additional sodium sulphide* over and above that used in the original preparation of the *poly*sulphide (Appellant's App. 121-123).

The first of these August experiments was carried out on August 22, 1934 and identified as experiment #1236. On the following day, as a check, this test was repeated as experiment #1237. Records of these two tests were made by Cunningham at the time (Appellant's App. 123) in his regular laboratory notebook #15 at pages 69 and 71, respectively (Appellant's App. 165-166). These two experiments were discussed with, and described to, Gage during a visit by Gage to Niagara Falls between the 6th and 10th of November, 1934 (Appellant's App. 153-154).

The next events of major importance were the carrying out of more detailed and exact experiments in April, 1935.* These April experiments went far beyond a mere attempt to produce sodium sulphide by the basically new process here in issue. They were concerned with ascertaining the purity of sodium sulphide produced by this process, and in particular with stopping the incidental production of small amounts of mercury sulphide. A further objective of these April tests was to ascertain the effect of the temperature on the reaction. However, in these further tests sodium amalgam, prepared by dissolving sodium in mercury in proportions of 8 grams of the former (Na) to 8,000 grams of the latter (Hg), again was reacted with sodium polysulphide solutions and final sodium sulphide solutions were obtained that were uncontaminated with mercury sulphide (Appellant's App. 127). There were two of these experiments carried out by Cunningham in April of 1935.

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*In the interim additional experiments embodying the process in controversy were carried out by Cunningham in December of 1934 and in March of 1935 (Appellant's App. 124-128). Records of these December and March operations were made by Cunningham at the time in his regular laboratory notebook at pages 26 and 73, respectively, of notebook #16 (Appellant's App. 167, 173). In addition in Cunningham's progress report for December, 1934 (Appellant's App. 169-171), Cunningham referred to the reaction here involved as one of several reactions that had been tried out in a preliminary manner and "found to react as written" (Appellant's App. 171).

They were identified as #1367 and #1368 (Appellant's App. 127-129). The first was carried out at a temperature of 60° C. and the second at a temperature of 40° C. Experiment #1367 was recorded at the time by Cunningham on pages 91 and 93 of his notebook #16 (Appellant's App. 174-175) while experiment #1368 was similarly reported on pages 95-96 of the same notebook (Appellant's App. 176-177).

These tests showed that lowering the temperature would not in itself prevent the formation of mercury sulphide as an impurity (Appellant's App. 128). They also showed that elimination of mercury sulphide as an impurity from the final product could be attained merely by continuing to add fresh sodium amalgam until any incidentally-formed mercury sulphide had completely disappeared, or alternatively by keeping a small excess concentration of sodium in the amalgam at all times (Appellant's App. 127). The laboratory notebook entries (Appellant's App. 174-177) also recorded the time required to complete the reaction. The titration figures therein recorded showed a high conversion of excess sulphur from the polysulphide into sodium sulphide with incidental formation of only small quantities of impurities.

At the trial of this case, Taylor, who has been actively engaged in carrying out and directing research in the alkali field continuously since 1919 (Appellant's App. 28-29) explained, as an expert, the notations recorded on pages 91-93, 95 and 96 of Cunningham's notebook #16 from the standpoint of the procedure involved, and he further pointed out that by his own (Taylor's) calculations, based on the original titration figures therein recorded, the sodium from the amalgam had converted a very high percentage of the excess sulphur from the *poly*sulphide into sodium sulphide (Appellant's App. 30-32, 39-40).

Following these April experiments no further experimental work involving the process here in issue was carried out by Cunningham prior to June 15, 1935, the filing date of Lanzetti's Italian application. But in this interval an important conference was held at appellant's laboratories in Niagara Falls between the 20th and 24th of May, 1935. Also a comprehensive report summarizing the more important research projects upon which work had been done by the entire research department, and recommending an increase in research expenditures to permit further development of such projects as had shown promise, was prepared by Taylor. Taylor's report (Appellant's App. 182-196) signed by Taylor on June 11, 1935, summarized the results of Cunningham's work on his sodium sulphide process and recommended this project as one of those to which substantial further attention should be given as soon as an allowance could be obtained for increased research expenditures. This Taylor report of June 11, 1935 stated (Appellant's App. 187):

> "Dr. Cunningham *has found* that sodium sulfide can be made with high efficiency and easily by dissolving sulfur in sodium sulfide solution and reducing the polysulfide with sodium amalgam." (Emphasis ours).

It then proceeded to make a rough estimate of the cost of producing sodium sulphide by Cunningham's process and recommended the giving of substantial further attention to the development of Cunningham's process (Appellant's App. 187-188). It concluded by recommending that research expenditures be increased for this purpose (Appellant's App. 195-196).

Gage testified (Appellant's App. 154-155) that, at conferences which he attended on May 20th to May 24th, 1935 in Niagara Falls, the Cunningham proposal, as subsequently described in Taylor's research summary of June 11th, was one of the subjects discussed. He further testified that as the result of these May conferences he (Gage) asked a Mr. Wittenberg, upon returning to New York, to make a survey of the available market for sodium sulphide, and that as a result Wittenberg did make such an investigation and transmitted a written report on or about August 13, 1935. This was confirmed by the testimony of Wittenberg (Appellant's App. 149-151) who also identified his written market report which appears in Appellant's Appendix at pages 245-259.

Taylor in addition to identifying his research summary and testifying that it was prepared by him sometime before June 11, 1935, on which date he signed it, also testified in the Patent Office proceedings to the effect that at the time of preparing this report:

> "*The work of Dr. Cunningham which I was familiar with,* and which extended for almost a year prior to the writing of this research summary, *had convinced me* that the scientific principle on which Dr. Cunningham was working was sound and that his process was operable as he conceived it *and had been carrying it out in the laboratory.* * * * The new process which involved the reaction of sodium amalgam with sodium polysulfide was compared [in the report] with the process for making sodium sulfide then in use, namely, the reduction of sodium sulfate with carbon. The comparison made the new process appear sufficiently favorable so that *a definite recommendation was made to continue work on the new process* using amalgam and *Dr. Cunningham was instructed to continue his laboratory experiments on this new process* (Appellant's App. 144).

It may be helpful at this point to note that the contemplated *further experiments* were concerned entirely with development of operating details productive of *maximum efficiency* and not with mere tests to establish the operability of a basically new process.

At the trial of this case before the District Court Taylor testified more specifically as to his contact with, and knowledge of, that part of Cunningham's work which was carried out prior to the preparation of Taylor's research summary of June 11, 1935. In this connection Taylor testified (Appellant's App. 30) that prior to the time when he signed the research summary on June 11, 1935, he had discussed with Cunningham *all of the experiments described in those pages of Cunningham's laboratory notebooks to which specific reference has thus far been made in this brief,* and in particular the April experiments recorded on pages 91, 93, 95 and 96 of Cunningham's notebook #16 (Appellant's App. 174, 175, 176 and 177). In a further and more detailed statement of his familiarity with that part of Cunningham's work which preceded the signing of Taylor's report of June 11, 1935, Taylor testified:

> "It is my particular business to keep in touch with what all the men in the laboratory are doing from day to day and sometimes from hour to hour, and I do this by going about in the laboratory and talking to the men at their work or having them come to the office and talk with me; *and I did this in connection with Dr. Cunningham's work at this time, before June 15, 1935. In doing this I talked with Dr. Cunningham. I saw his equipment and saw his note book; saw his method of analysis and calculation therefrom, and satisfied myself that he was doing what he alleged to be doing; and I particularly was impressed with his statement about the formation of mercury sulfide.* I thought that had there been any doubt as to whether or not he was working on that subject and doing what he said he was doing, that doubt would have been dispelled *by this account which he gave to me as to the formation of mercury sulfide at the end of each of these runs which I just described. That would not have been possible to have predicted unless somebody had actually carried that experiment out.*
>
> Q. And did you make any attempt to check his method of analysis and see whether it was a standard method, and see whether his calculations led you to the same conclusion as it did him, with respect to what his data showed?
>
> A. Yes, I did. He used methods which were standard, given in a book by Griffin, and there was no question as to the analytical part of his work" (Appellant's App. 33-34).

In describing still more specifically the information concerning the phenomena of incidental mercury sulphide formation and the means of eliminating it *that Taylor already had derived from Cunningham's notebook records and from his conferences with Cunningham, prior to the preparation of Taylor's research summary of June 11, 1935,* Taylor testified (Appellant's App. 39):

> "When I mentioned that a formation of mercury sulphide at the end of each run I should have said *at the end of each intermediate stage of the run there described.* The phenomenal thing was that the mercury sulfide having been formed, it was used up by the additional quantities of sodium, and that when we had enough sodium in the batch to completely use all the sulfide then the mercury sulfide no longer appeared, so that in the final stage of this experiment there was no mercury sulfide."

Taylor also added with meticulous exactness:

> "while I was in Dr. Cunningham's laboratory, and observed the note books and his equipment, and what he was working at * * * I do not wish to convey the impression that I ever saw the actual carrying out by him of a *complete* experiment. I don't remember having seen him do this, although I may have seen him."

Again referring to those conferences between Taylor and Cunningham which preceded the completion of Taylor's written report of June 11, 1935, Taylor testified as follows (Appellant's App. 34):

> "Q. In these conferences, from time to time, was there any discussion by you as to what tests were, or should be, made?
>
> A. Well, there was. That was one of the important purposes of these conferences—to determine what should be done in that respect."

Cunningham, when asked as to whether he had worked with Taylor in connection with the preparation of Taylor's research summary of June 11, 1935, testified:

> "Yes, sir. *I worked with Mr. Taylor* as a matter of fact *all through this work;* I was consulting with Mr. Taylor from time to time on various features of the use of sodium amalgam to produce sodium sulfide and other compounds of a similar nature" (Appellant's App. 131).

Before passing on to the activities of Cunningham that were subsequent to June 15, 1935, we digress to point out that the wholly independent experiments performed by Lanzetti in Italy corroborate the testimony and notebook records of Cunningham in showing not only that sodium amalgam does in fact react with an aqueous solution of sodium polysulphide to form sodium sulphide and that this reaction is basically new and unmentioned in all of the chemical literature, but also as to the phenomena of incidental *mercury* sulphide formation and the means of eliminating mercury sulphide from the final product (Appellant's App. 316-318).

Activities Subsequent to June 15, 1935

In the period intervening between June 11, 1935 and Cunningham's return from his vacation in the latter part of August, 1935, Cunningham did not carry out any additional *experimental* work in connection with *the process here in issue.* During this period Cunningham devoted his time largely to making a cost estimate with respect to his sodium sulphide process that was independent of that made by Taylor and to the making of an extensive search of the chemical literature in respect to various uses of sodium amalgam. The objective of this search was to ascertain the *novelty* of several processes involving the use of sodium amalgam, including the sodium sulphide process here in issue, that had been concurrently developed in Cunningham's exploratory researches. Cunningham's activities in this period immediately preceding his vacation were described in Cunningham's testimony (Appellant's App. 132-133), also in his progress report for June, 1935 (Appellant's App. 196-197) and in his combined progress report for July and August, 1935 (Appellant's App. 205). The latter report concluded by pointing out that it would seem possible for Mathieson to obtain "basic patent protection" on the sodium sulphide process because a "thorough search" of the literature had disclosed no reference to this process. In this connection the report also stated:

> "A patent memo will be written up covering this process."

The circumstance that no further *experimental* work in connection with the process here in issue was carried out by Cunningham in the period between the early part of June, 1935 and his return from his vacation in the latter part of August, 1935, was not due to any instructions from his superiors to this effect. Taylor testified (Appellant's App. 34-35) that no such instructions were given but that on the contrary he had conferred with Cunningham in the early part of June concerning the making of further tests to ascertain whether sodium sulphide could be made directly in the form of *concentrated* solutions by means of the Cunningham process* and that he was very anxious that Cunningham should proceed with this further test work. Indeed Taylor testified specifically, that at the time of preparing the June 11, 1935 research summary:

> "* * * Dr. Cunningham was instructed to continue his laboratory experiments on this new process." (Appellant's App. 144).

In the pre-vacation confusion Taylor did not have an opportunity to keep in close touch with Cunningham. Therefore at the time Cunningham started on his vacation Taylor did not know whether Cunningham had as yet carried out these previously planned *additional* tests (Appellant's App. 37-38). Gage, like Taylor, did not have any definite information as to whether Cunningham was completing the exploratory research on his sodium sulphide process during the summer months of 1935. But when this sodium sulphide process was again brought sharply to Gage's attention by the transmission of Wittenberg's market report, he promptly forwarded same to Taylor with a letter dated August 15, 1935 (Appellant's App. 156, 243-244). In this letter Gage said of the report:

> "I have not as yet been over it."

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*Whether or not the Cunningham process would directly produce sodium sulphide in *concentrated* solutions is a detail affecting only the ultimate cost of producing sodium sulphide by this process, not the ability of the process to produce sodium sulphide (Appellant's App. 58).

Yet, without knowledge of the contents of the Wittenberg report, Gage in his letter urged Taylor to press the further development of the commercial aspects of Cunningham's process by stating:

> "I would like to have this matter carried forward as rapidly as possible and would like something done on it while you are away."

As the result of the pressure thus brought to bear by Gage, Cunningham, upon returning from his vacation in the latter part of August, laid aside all of the other projects to which a part of his efforts had heretofore been directed and concentrated his efforts on his sodium sulphide process. Cunningham's testimony to the effect that upon returning from his vacation he "did start a much enlarged amount of work—a much greater amount of work" (Appellant's App. 132-133), is corroborated not only by the records of a test on August 28, 1935 appearing on pages 170-173 of his laboratory notebook #16 (Appellant's App. 201-204) and by the many subsequent notebook entries identified by Cunningham and reproduced in Appellant's Appendix at pages 207-213 and 217-221, but also by Cunningham's progress report for September 1935 (Appellant's App. 215) which stated:

> "Work during the month was concentrated on the process for making sodium sulfide. The other proposed processes for using sodium amalgam were set aside for the time being."

This concentration of work on the sodium sulphide process continued until the latter part of October, 1935, by which time the exploratory work required for detailed cost estimates on this process had been completed. Cunningham's progress report for October 1935 (Appellant's App. 223) states:

> "The exploratory work on this problem was finished during the month and the further development to the pilot plant stage was turned over to Mr. MacMullin."

This monthly progress report also asserted that a final report reviewing his work on this process *had been* written, and that a patent memorandum covering the basic features of this process *had been* written.

Cunningham testified that the monthly progress report for October, 1935, was prepared during the first week of November (Appellant's App. 138) and he identified both the patent memo and the final research report referred to therein (Appellant's App. 138-139). The patent memo appears in Appellant's Appendix at pages 224-229 and the final research report at pages 231-239.

Taylor testified (Appellant's App. 147-148) that he received the patent memorandum from Cunningham, and that after reviewing it carefully he sent it on to Gage. Gage received the patent memorandum and after reviewing it transmitted it to appellant's patent attorneys on December 16, 1935 to serve as a basis for a patent application (Appellant's App. 157). The letter of transmittal, dated December 16, 1935, and identified by Gage (Appellant's App. 157) is reproduced at page 260 in Appellant's Appendix. The Cunningham application here involved was in due course prepared therefrom and filed on February 4, 1936.

Taylor also testified (Appellant's App. 148) that Cunningham's detailed final research report (Appellant's App. 231-239) was received by Taylor prior to December 6, 1935 upon which date Taylor signed it. This report was subsequently transmitted to Gage (Appellant's App. 156).

Cunningham's detailed final research report (Appellant's App. 231-239), prepared in the fall of 1935, at the conclusion of all of Cunningham's exploratory work in connection with his sodium sulphide process, reviews the more important individual tests and shows *their relationship as a part of a unified whole.* The experiments reviewed in this report start with experiments #1367 and #1368 which were carried out by Cunningham in April of 1935 and which were contemporaneously recorded in the pages of his notebook appearing in Appellant's Appendix at pages 174-177. This final report also reviewed all subsequent experiments up to and including experiment #1415 which was carried out on October 24, 1935.

The precise details of tests that were *subsequent to Cunningham's return from his vacation,* or for that matter subsequent to the conference with Gage and Taylor in May of 1935, are of little consequence here because they are concerned merely with investigations of details intended to permit a very accurate estimation of the ultimate *maximum economic value* of Cunningham's *basically new process.* They are material to the present controversy largely from the standpoint of showing that Cunningham's April experiments were not regarded as unsuccessful and abandoned experiments, and that there never was any intent to abandon Cunningham's sodium sulphide process.

There is one further circumstance worthy of note because of its bearing on the weight to be given to the representations (both oral and written) made by Taylor and by Cunningham to their superiors in the spring and summer of 1935. This was the circumstance that the Mathieson Alkali Works in 1935 was confronted with a rather serious commercial problem necessitating the development of new methods for making marketable sodium compounds (other than the usual caustic soda) from the sodium amalgam conventionally obtained as an intermediate in the manufacture of chlorine from sodium chloride (salt) by electrolysis. The first paragraph of Cunningham's final research report (Appellant's App. 231) and the first two and one-half pages of Taylor's research summary of June 11, 1935 (Appellant's App. 182-184) show a recognition of the nature of the commercial problem then confronting the Mathieson Alkali Works; a problem characterized by Cunningham as presenting an "urgent need".

Taylor's June report outlines the problem and the conditions that created it. It points out that the demand for chlorine was strong and gave evidence of increasing; whereas the market for alkali (caustic soda) was highly competitive. The report points out that the latter circumstance already had forced Mathieson to curtail its chlorine production notwithstanding the strong and increasing demand for chlorine. The report points out that the object in attempting to discover and develop commercially feasible processes for converting sodium into marketable sodium compounds other than caustic (e. g., sodium sulphide) was for the purpose of "restoring high production capacity" for chlorine which already had been lost due to other causes than inability to produce chlorine.

Cunningham's sodium sulphide process, as well as other new uses for sodium amalgam concurrently developed by Cunningham's exploratory researches, were represented by Taylor in his June report as offering at least partial relief. On the basis of these representations Taylor's June report made two specific recommendations. The first was that the Mathieson Alkali Works "should proceed with the production of what chlorine it wants in the South by the electrolysis process". The second was that research expenditures be increased to permit still further development of the sodium sulphide process and certain other processes involving the utilization of sodium amalgam. An important representation in support of these recommendations was the representation concerning the progress thus far made by Dr. Cunningham on his sodium sulphide process.

Decision of the Patent Office Board of Appeals

The Patent Office Board of Appeals in its opinion (Appellant's App. 311-313) acknowledged that the testimony of Cunningham together with his notebooks and the work reports which

> "* * * passed out of Cunningham's direct control long prior to any date which can be accorded to Lanzetti are doubtless sufficient to show a conception of the invention"

by Cunningham prior to the filing date of Lanzetti's Italian application which is the earliest date that can be accorded to Lanzetti in any event.

However, the Board rejected the testimony of Cunningham *as to performance of the experiments that were completed prior to June, 1935,* on the ground that this testimony was not supported by "direct corroboratory evidence". The factor apparently regarded as being of controlling importance in this respect was stated by the Board in the following language (Appellant's App. 313):

> "So far as we can discover, no witness called on behalf of Cunningham ever saw any actual carrying out of the process involved in the counts on appeal. In the absence of direct corroboratory evidence with respect to the actual carrying out of the process, it is not seen how a holding of actual reduction to practice can be made."

The Board further held that the certificate accompanying Lanzetti's Italian patent "should be construed" as establishing that the invention in issue was fully disclosed in Lanzetti's Italian application *as filed* and therefore that Lanzetti should be "accorded the benefit of his foreign filing date".

As to the question of Cunningham's diligence, the Board held that the evidence showed diligence by Cunningham "up to about May 1, 1935". However, the Board held that:

> "From this time [about May 1, 1935] to about August 15, 1935, there is no activity looking directly to the completion of the invention in issue or to the mechanical furtherance thereof."

It was within this period that Lanzetti's Italian application was filed and, in view of these circumstances, the Board held that Cunningham was not diligent at the time his opponent entered the field.

In view of its conclusions on these four matters the Board awarded priority to Lanzetti.

The Decision of the District Court

The District Court followed the decision of the Board of Appeals on each of the four points just enumerated. As to the matter of conception, the opinion of the Court stated (Appellant's App. 13):

> "I agree with the Board of Appeals of the Patent Office that the testimony of Cunningham together with

> certain note books are sufficient to show a conception of the invention before any date that can be awarded to the defendant. [Lanzetti]".

The District Court in its fourth finding of fact (Appellant's App. 15) also accorded to Lanzetti the benefit of his Italian filing date.

Furthermore, the opinion of the District Court noted the importance the Patent Office Board of Appeals had attached to the circumstance that:

> "* * * there was no witness other than Cunningham who actually saw the carrying out of the process * * *"

and further noted that in view thereof the Board had

> "* * * held, apparently as a matter of law that the evidence referred to in corroboration of Cunningham's testimony was merely hearsay so far as the performance of the invention was concerned * * *."

so that

> "* * * the contention of Cunningham that he had actually carried out the process at the time that he claimed to do so was not sustained."

The additional testimony and other evidence submitted at the trial before the District Court, in view of Taylor's acknowledgment that in the period preceding June 11, 1935 he could not recall ever having seen Cunningham carry out a complete experiment (Appellant's App. 39), did not *in the respect above noted* alter the situation upon which the Board of Appeals had predicated its decision. And while the District Court refrained from going so far as to hold that as a matter of law the testimony of an inventor as to the performance of a test could *never* be accepted with corroboration of a degree "lesser than" the testimony of a corroborating witness who had actually observed a complete test, the District Court refused to accept "some lesser degree of corroboration" in the instant case because of the circumstances that the inventor's testimony in this instance was by deposition and without cross examination.

The Statutes Involved

The relevant parts of those statutes which bear upon the issues involved in the present case are set forth in Appendix B at the end of this brief. They include:

Act of June 20, 1936, c. 640 (1, 49 Stat. 1561),
U. S. Code, Title 28, Sec. 695
U. S. Code, Title 35, Sec. 32 (4887 R. S.)
U. S. Code, Title 35, Sec. 63 (4915 R. S.)
U. S. Code, Title 35, Sec. 72 (4923 R. S.)

Statement of Points

Appellant contends that the District Court's findings numbered 8, 9 and 4 are in error. The three questions raised by this assignment of error and here to be determined are:

(1) Is the evidence submitted on behalf of appellant sufficient to support a finding that prior to June 15, 1935 Cunningham actually mixed sodium amalgam with an aqueous solution of sodium polysulphide and recognized that the resulting reaction produced sodium sulphide, thereby accomplishing a reduction to practice of a generic invention?

(2) Does the evidence submitted on behalf of appellant establish diligence by Cunningham and his assignee connecting his admitted conception in the spring of 1935 with the filing of his application here involved; the only critical period being the time intervening between June 15, 1935 (when Lanzetti filed his Italian application) and the latter part of August, 1935 following which Cunningham laid aside all other work and began concentrating his entire efforts on experiments directed toward commercialization of the sodium sulphide process here in issue?

(3) Do the documents filed in support of appellee's claim that the Lanzetti Italian application, in the form in which it existed at the time when it was filed in June, 1935, contained a disclosure of the invention here in issue, sustain that claim with a

> degree of certainty sufficient to deprive Cunningham of the right to prevail on the basis of his earlier filing date in this country?

Appellant contends that the proper answer to *any one* of these questions entitles appellant to prevail irrespective of what disposition is made of the others. These questions arise, respectively, from the above listed errors in the findings of the District Court. In the argument they will be considered in the order above presented.

SUMMARY OF ARGUMENT

Point 1

This point involves a question of law, namely the character of the evidence required by law to corroborate the testimony of an inventor as to reduction to practice.* There can be no serious dispute as to the facts involved in its determination.

The testimony of Cunningham as to the tests performed by him either in August, 1934, or in April, 1935, if accepted, establishes a reduction to practice by him prior to the earliest date that can be accorded to Lanzetti in any event. Cunningham has not been discredited in any way. His testimony was given in November, 1937, about two and one-half years subsequent to the tests of April, 1935, and there was an abundance of exact contemporaneous documentary evidence to refresh his recollection. The testimony of Cunningham in the Patent Office interference was taken pursuant to adequate notice, and the statute here applicable provides that such testimony when admitted shall have the same force and effect as if originally taken and produced in the suit. Appellee did not object to the admission of any of the testimony of record in the Patent Office. Therefore, Cunningham's testimony is competent, and, if corroborated, should be accepted.

Corroboration does not require complete and independent proof, such that the testimony to be corroborated is merely cumulative. Prior to the preparation of Taylor's June 11, 1935 report, Taylor had derived from Cunningham (through his conferences with Cunningham and from Cunningham's notebook entries) knowledge of the several unusual phenomena that occur when sodium amalgam is mixed with an aqueous solution of sodium polysulphide. These phenomena included both the occurrence of the hitherto unknown basic reaction resulting in the formation of sodium sulphide and the incidental formation of black mercury sulphide as an impurity under certain conditions but not under others. Taylor, an expert with extensive experience in research in the field of alkalies, has testified that in his opinion the occurrence of these phenomena could not have been predicted and therefore that accurate knowledge of these phenomena could be had only by actually carrying out the experiments. On this point there is no contradicting evidence.

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*This was admitted by counsel for appellee in his opening statement at the trial before the District Court (Appellant's App. 23).

Cunningham's notebook records are a *type of writing* falling squarely within the specific provisions of Sec. 695, Title 28, U. S. Code, and therefore are in themselves evidence of the acts recorded therein. Further reflexive corroboration of the April experiments #1367 and #1368 is afforded by their detailed review in Cunningham's final research report.

The representations made by Taylor concerning Cunningham's findings and Taylor's recommendations to Gage based thereon, as set forth in Taylor's research report of June 11, 1935, together with the direct evidence of the fact that knowledge of the unusual phenomena encountered (when the described tests actually are carried out) was already in Cunningham's possession in the spring of 1935, constitute corroborative evidence so compelling that to reject the testimony of Cunningham with respect to the tests in the spring of 1935 necessitates concluding (a) that the testimony of both Cunningham and Taylor involved wilful perjury, (b) that both made wilful misrepresentations to their superiors in a deliberate attempt to mislead them, (c) that Cunningham wilfully falsified the permanent records of the company by which he was employed and (d) that in addition

Cunningham was an adept clairvoyant who accurately predicted, in advance of tests, the several phenomena then unknown in the entire field of chemistry *but now known to occur* when sodium amalgam is mixed with an aqueous solution of sodium polysulphide.

We think that if the correct rule of law is applied to the evidence in this case, and the testimony of Cunningham is weighed in the light of all of the surrounding circumstances established by the evidence, it will be necessary to conclude that reduction to practice by Cunningham prior to June 15, 1935 is proven beyond a reasonable doubt, unless there be suspicion of fraud and wilful perjury by both Cunningham and Taylor.

Point 2

In view of Cunningham's admitted conception prior to June 15, 1935, appellant must prevail even though Lanzetti is accorded the benefit of his Italian filing date and even though Cunningham is not accorded a reduction to practice prior to this date, unless the record shows that Cunningham was lacking in diligence during the summer of 1935. The Board of Appeals has acknowledged that there was diligence subsequent to about August 15, 1935 so that the only material period where the diligence of Cunningham is questioned is that included between June 14, 1935 and about August 15, 1935.

In the absence of evidence of intent to abandon, neither "uninterrupted effort nor the concentration of all of the applicant's energies upon the single enterprise"* are required to sustain a finding of diligence. Cunningham's activities in the summer of 1935 in making an independent estimate of the relative costs of producing sodium sulphide, by his process and by the sodium sulfate reducing process then in commercial use, and his further activity in making a thorough literature search to ascertain the degree of novelty of the process he believed to be new and thus to determine the scope of the invention for which patent protection should be sought, deny the existence of any intent to abandon. Moreover the literature search, conducted to afford a guide for use in the subsequent preparation of a patent application, constituted diligence in the direction of a *constructive* reduction to practice.

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*Dickinson v. Swinehart, 49 App. D. C. 222.

The stipulated testimony of Lanzetti, concerning his own activities in Italy, show that the parallel conduct of Cunningham was reasonable, and that the amount of time Cunningham devoted to these investigations was not unreasonable. We think Cunningham's activities during the summer of 1935 were adequate under the law to sustain a finding that he was not lacking in diligence.

Point 3

It is apparent from the face of the "paper writing", identified in the certificate of the document filed by Lanzetti in support of his motion to shift the burden of proof, that the *certificate* does not set forth "a true state of facts". This has been acknowledged by the Board of Appeals which based its decision in part upon its stated opinion as to how "the certificate should be construed". Appellant has no way of knowing whether the certificate, admittedly inaccurate on its face in certain respects, is not also inaccurate in other respects. The discrepancy, if of no significance, could easily have been remedied through the simple expedient of producing a properly certified copy of Lanzetti's Italian application in the form in which it existed when filed on June 15, 1935, together with a properly proven translation thereof. Since this was not done, Lanzetti is not entitled to have the effective filing date of his United States application advanced from its actual filing date (April 15, 1936) to June 15, 1935. The facts concerning the identity of Lanzetti's Italian application in its original form are peculiarly within the knowledge of appellee and his assignor Lanzetti. Appellant does not have access to these records. Appellant and its assignor, continuously through the four year period immediately preceding the trial of this case, had objected to the sufficiency of the document filed in support of the motion to shift. Accordingly, ample opportunity was afforded appellee to remedy the defect complained of if it were without significance.

Appellee's entire case depends upon his right to the benefit of his Italian filing date. He certainly is in no position to ask for relaxation of the strict rules of evidence acknowledged by this Court as proper under these circumstances, in *Guettler* v. *Alfsen,* 53 App. D. C. 215, *so long as he continues to urge* adherence to the harsh rule applied by the Board of Appeals in this case and in the case of *Bainbridge* v. *Walton,** more fully discussed hereinafter.

ARGUMENT

Point 1

The question presented by this point is whether there is sufficient evidence to corroborate the testimony of Cunningham as to the tests he performed prior to June 15, 1935, and its determination involves consideration of the requirement of the law as to the kind of evidence required to corroborate as to a reduction to practice.

In view of the admission in Lanzetti's preliminary statement that the first introduction of the invention into this country by him was concurrent with the filing of his United States application, Lanzetti is in no event entitled to an earlier date than the filing date of his Italian application (June 15, 1935). In the present situation activities by Lanzetti elsewhere than in this country cannot be considered in deciding priority, as is specifically provided by the statute (U. S. Code, Title 35, Section 72; Section 4923 R. S.) except to the extent provided by Section 4887 R. S. (U. S. Code, Title 35, Section 32) which gives an applicant in the United States the effective filing date of an earlier foreign application for the same subject matter that has been filed within the preceding year.

It is not necessary for an inventor to establish diligence during the period intervening between reduction to practice and the filing of his application, as diligence is required only during the period intervening between conception and reduction to practice, *Oliver* v. *Felbel,* 20 App. D. C. 255; *Lederer* v. *Walker,* 39 App. D. C. 122. Accordingly, if it is established that Cunningham reduced the invention in issue to practice earlier than June 15, 1935, appellant must prevail since it then becomes immaterial whether Lanzetti is accorded the benefit of his Italian filing date, or whether Cunningham was diligent between June 15, 1935 and February 4, 1936 when his application was filed.

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*The pertinent parts of the decision of the Board of Appeals in this case are reproduced in the decision of the Court in *Bainbridge* v. *Walton,* 26 C. C. P. A. 1417, 1420.

In the circumstances existing in this case a reduction to practice of the invention defined in count 1 involves nothing more than (1) performance of the act of mixing sodium amalgam with an aqueous solution of sodium polysulphide and (2) recognition of the now established fact that the chemical reaction which occurs, when these two substances are mixed, inherently produces sodium sulphide. The invention here is *broad and generic* and therefore a reduction to practice does not require establishment of the various conditions essential to attainment of maximum efficiency, or production of the sodium sulphide in some particular form or degree of purity or concentration, or even development of the process conditions to a point where immediate commercial value is established, *Hildreth* v. *Mastoras,* 257 U. S. 27, 34; *Jenner* v. *Dickinson; Thibodeau* v. *Dickinson,* 25 App. D. C. 316. Wholly aside from the testimony of any witness called on behalf of Cunningham, it is independently established, by the stipulated testimony of Lanzetti, that when sodium amalgam is mixed with an aqueous solution of sodium polysulphide *there does in fact occur* a chemical reaction that produces sodium sulphide.

Accordingly, either the experiments carried out by Cunningham in August of 1934 or those carried out in April, 1935 embodied a reduction to practice, if the testimony of Cunningham as to what he did in carrying out these experiments be accepted. This was acknowledged by all Patent Office tribunals and by the District Court in awarding Cunningham a date of conception in advance of Lanzetti's asserted Italian filing date.

On the other hand it is acknowledged by appellant that probably no one other than Cunningham actually witnessed the carrying out of any one of these August or April tests *in its entirety.* Accordingly, since Cunningham is the inventor, we agree that his testimony as to performance of the tests must be corroborated.

The Patent Office Board of Appeals and the District Court both appear to have based their finding that the testimony of Cunningham as to these tests is *not corroborated,* on the erroneous theory that at least where the inventor's testimony is by deposition (as it must always be in an interference proceeding in the Patent Office) no "lesser degree of corroboration" is sufficient to warrant its acceptance than the direct testimony of a witness other than the inventor who actually observed one or more of the complete tests relied upon as a reduction to practice.

This is tantamount to holding that the testimony of an inventor as to the performance of acts relied upon as reduction to practice if taken by deposition, is either wholly incompetent or, at best, acceptable only in the event that it is merely cumulative. It is tantamount to holding that *circumstantial evidence* cannot be accepted as corroborating the testimony of an inventor as to performance of the acts involving a reduction to practice no matter how compelling the circumstantial evidence may be. It is tantamount to holding that adequately to corroborate the testimony of an inventor, as to performance of the acts relied upon as a reduction to practice, involves the carrying of a burden heavier than that imposed upon the prosecution to sustain a conviction for first degree murder, either in that class of cases where no available witness actually observed the commission of the crime or that class of cases where the only witness to observe the crime was an accomplice whose testimony is wholly incompetent unless corroborated.

This involves a misconception or misapplication of the fundamental rules of evidence. It fails to differentiate between corroboration and *independent proof so complete in itself* that the testimony to be *corroborated* is at best merely cumulative. The distinction is aptly explained in *People* v. *Becker,* 215 N. Y. 216, wherein the Court stated:

> "The law does not require that the whole case shall be proved outside of the testimony of the accomplice. If it did, testimony of accomplices would never avail anything excepting as cumulative evidence. The other evidence required by the code need only *tend* to connect the accused with the commission of the offense."

The fundamental rules of evidence are no different as applied to controversies involving priority of invention, except that under circumstances such as here existed the burden of proof was much lighter than the burden imposed on the state to sustain a conviction for a crime such as murder. Where, as here, the interfering applications were copending, the junior party

> "* * * merely has the burden of establishing his case by a preponderance of the evidence".

He was not required

> "* * * to prove his case beyond a reasonable doubt". *Luckett* v. *Straub,* 47 App. D. C. 379.

A case in point is the Patent Office Interference known as *De Forest* v. *Meissner* v. *Armstrong* v. *Langmuir,* subsequently passed upon by the Court of Appeals for the District of Columbia in *De Forest* v. *Meissner* v. *Langmuir* v. *Armstrong,* 54 App. D. C. 391. In that controversy the facts in support of Armstrong's case were outlined in the manuscript decision of Assistant Commissioner Kinnan.* Incidentally the testimony of Armstrong in that interference proceeding, as to the acts relied upon to establish his reduction to practice, *was by deposition* although prior to the decision by the Commissioner similar testimony had been given in a patent infringement suit.

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*The decision of the Assistant Commissioner in the De Forest case has not been published, but a copy thereof has been supplied to counsel for appellee herein and a certified copy of this decision will be provided at the hearing on this appeal.

In that case Armstrong established conception through a notarized sketch of the radio circuit there in controversy. For reduction to practice he relied upon the construction and successful operation of a radio set asserted to embody the circuit in controversy. No one but Armstrong knew the wire up (i.e., the circuit) actually incorporated in this radio set but several witnesses had seen the set and heard it operate. The decision of Assistant Commissioner Kinnan states:

> "There is no witness who corroborates Armstrong's story as to the circuits he used and when he used them. Mason's testimony is, as above noted, not available. No one else saw Armstrong's wire up. He understood it and knew what was included in it. The practice is settled that the mere uncorroborated statements of an inventor as to what was in his mind at a certain time or what he did on a certain date cannot be accepted in support of his claim as a prior inventor over the established date of his rival [citations]. But such salutary and necessary rule does not exclude the testimony of a litigant, *when supported by circumstantial evidence* or that of physical things; like sketches and devices, accompanied by evidence of their date of production, since to so hold would violate the elementary law of evidence.
>
> * * * * * *
>
> "These facts, as is well expressed by Judge Mayer in his decision upon the same testimony, refer to 'physical things' and justifies his conclusion, confirmed by the Court of Appeals, that Armstrong was in possession of the invention as early as January 31, 1913, is entitled to that date for conception of the invention and, by virtue of his using it upon his receiving set, *a reduction to practice.*" (Emphasis ours).

In this Armstrong interference, the Court of Appeals for the District of Columbia *followed the decision of the Assistant Commissioner of Patents in giving Armstrong the benefit of the reduction to practice established solely by his testimony and the corroborating circumstantial evidence*, although the Court of Appeals awarded priority to

De Forest as a result of its holding that De Forest had established an even *earlier* reduction to practice. Thus the Court said (54 App. D. C. 391):

> "Especially are we impressed by the party Armstrong and his witnesses. *We have no doubt but what he produced the invention at the time alleged, and did all the things attributed to him by the testimony,* as set forth in this record. His earliest claim to a conception of this invention is October, 1912, followed by a witnessed sketch on January 31, 1913. This date antedates any time claimed by or available to either the party Meissner or Langmuir. These parties, therefore, are eliminated from further consideration. (Emphasis ours).
>
> "This narrows the case to De Forest and Armstrong. It is clearly shown that De Forest was developing the idea involved in this invention in the early part of 1912, and it is claimed that the work culminated in a complete disclosure of the invention in August of that year. If this claim is sustained, De Forest must prevail."

The rule that corroboration may exist in established circumstances admitting of satisfactory inference was recognized and expressly annunciated by this Court in *Kitchen* v. *Smith,* 39 App. D. C. 500. In that case the circumstance that a defect, apparent in an October drawing, had been remedied in the drawing of Smith's application filed in the following April was held adequate *to corroborate the otherwise unsupported testimony of Smith** to the effect that during the intervening period he gave his leisure time to the problem of remedying the defect embodied in the October design. In its decision in that case the Court expressly pointed out that the inventor *is a competent witness in his own behalf* and at the same time acknowledged the salutary rule requiring corroboration. The Court brushed aside the abstract question as to whether the necessity for corroboration extended to testimony concerning facts material to diligence, as well as to conception and reduction to practice, as a question "unnecessary to pursue" in view of its affirmative finding as to the substantial question "* * * was Smith corroborated in respect of holding back his invention while working out the problem above mentioned?" In the opinion in that case the Court stated:

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*The testimony of Smith in that case was by deposition, as in all interference proceedings.

> "It is well settled that while the inventor is a competent witness on his own behalf, his uncorroborated testimony is not sufficient to establish conception of the invention, or its reduction to practice.
>
> * * * * * *
>
> "The substantial question is, was Smith corroborated in respect of holding back his invention while working out the problem above mentioned? As held by the Commissioner, corroboration may exist in established cricumstances admitting of satisfactory inference. The improvement worked out in the mind of Smith found expression in his later drawing which became a part of his application."

An outstanding case dealing with the kind of evidence required for corroboration in a patent controversy is the case of *Corona Cord Tire Company* v. *Dovan Chemical Corporation,* 276 U. S. 358. That case involved a suit for infringement of a Weiss patent directed to the use of D.P.G. (diphenylguanidine) as an accelerator in the vulcanization of rubber. One of the defenses, which was sustained by the Supreme Court, was a prior use and sale asserted to have taken place in August of 1917. This prior use was alleged to consist of the preparation by one Dr. Kratz and the sale by the Falls Rubber Company, by which he was employed, of 300 inner tubes for automobile tires accelerated by D.P.G. as covered by the patent in suit. Various corroborating facts were established by the evidence including the record of a shipment of the tubes and the fact that some *two years later,* in September of 1919, Dr. Kratz read a paper discussing the use of D.P.G. as an accelerator at the Philadelphia meeting of the American Chemical Society. However, whether or not D.P.G. was used as an accelerator in the tubes made and sold by the

Falls Rubber Company in 1917 *rested solely upon the testimony of Kratz* and the corroborating circumstantial evidence. This is pointed out in the decision of the Supreme Court in the following language:

> "He says that this was a special order; that he had at the time a small supply of D.P.G. which he himself had made; that these 300 tubes exhausted his supply, and that in filling the remainder another accelerator was used. This sale and the use of D.P.G. as an accelerator took place in August, 1917, as shown by the memoranda that Kratz produces. The record of the shipment of the 1,000 tubes, the memorandum shipping order by Kratz and the O.K. by the President of the Falls Company are introduced.
>
> "*Kratz says he did not tell anyone of his use of D.P.G. in these 300 tubes.* This is urged by respondent as a reason for discrediting it. Were this an isolated instance not taken out of the history of all of Kratz's relation to accelerators and to D.P.G., it might reasonably give rise to such question. But the undoubted fact that Kratz had demonstrated the utility of D.P.G. in his eight or nine tests in 1916 at Norwalk, and the corroboration of Dr. Russell as to his work there, and the memorandum which he had taken with him of the tests and of the report, to the Falls Rubber Company, *and, indeed, the reflexive corroboration of his paper at Philadelphia,* show undoubtedly that he knew the excellence of D.P.G. as an accelator, and tend to confirm his account as to the 300 tube sale. It was not unnatural that with a small amount of D.P.G. he should try it in a special order of this kind from which he might confirm the conclusion he had already reached."

It will be noted that

(1) The work of Kratz at Norwalk in 1916,

(2) The memoranda which he had taken with him of the tests at Norwalk and of the report to the Falls Rubber Company, and

(3) The reading of the Kratz paper at Philadelphia in 1919,

are not in any sense direct affirmative evidence *of the use of D.P.G. as an accelerator in the 300 tubes prepared and sold in August of 1917 while Kratz was chief chemist of the Falls Rubber Company.* Yet each of these items of evidence independently, and all of them collectively, were *corroborative* of the testimony of Kratz as to the use of D.P.G. in the 300 tubes made and sold in 1917 and were stated to be so by the Supreme Court. Even stronger evidence is required to invalidate an issued patent than that required to sustain a claim of prior invention in an interference. But even so, here in this *Corona* case the Supreme Court invalidated the patent and found this prior use and sale to be adequately established by one witness because the surrounding circumstances furnished such strong corroboration of that witness' testimony as to be convincing that the prior use and sale occurred as the witness alleged. The Supreme Court directed attention to the fact that Kratz was the only witness on this prior use and added that that was not a fatal deficiency of the proof because of the "other circumstances" including "the reflexive corroboration" of a later incident.

There is another phase of the *Corona* case which is directly applicable to the facts in this instance. In the *Corona* case the Supreme Court made a direct application of the principle involved to interferences. It pointed out that entirely aside from the prior use and sale in 1917, Kratz's work at Norwalk in 1916 was corroborated sufficiently by the testimony of Dr. Russell and by the contemporaneous documentary evidence to establish a reduction to practice by Kratz. Dr. Russell, Kratz's superior at the Norwalk company, testified that he knew of Kratz's work at Norwalk at the time as the result of his conversations with Kratz. The testimony of Dr. Russell in this connection read as follows:

> "Q19. Were you familiar with the work he was doing at that time?
> A. Absolutely.
> Q20. *How closely in touch were you with this work?*
> A. *We had conversations on it* practically every day.

> Q21. What was your relation to him at that time officially?
>
> A. Officially I suppose I was his superior officer." (Emphasis ours).

It is thus apparent that Dr. Russell's corroboration of the work done by Kratz at Norwalk in that case was not even as strong as Taylor's corroboration of Cunningham's work immediately preceding the writing of Taylor's letter of June 11, 1935. Yet the decision of the Supreme Court in the *Corona* case reads as follows:

> "But even if we ignore this evidence of Kratz's actual use of D.P.G. in these rubber inner tubes which were sold, what he did at Norwalk, supported by the evidence of Dr. Russell, his chief, and by the indubitable records that are not challenged, leaves no doubt in our minds that he did discover in 1916 the strength of D.P.G. as an accelerator as compared with the then known accelerators, and that he then demonstrated it *by a reduction of it to practice* in production of cured or vulcanized rubber.
>
> "This constitutes priority in this case. * * * *If he had been applying for a patent for the discovery, he clearly could have maintained proof of a reduction to practice.*" (Emphasis ours).

These several cases establish that reduction to practice in an interference can be proven by any evidence of any kind which suffices to carry conviction that the alleged facts are true facts, there being no rule whatever as to what particular kind or kinds or what minimum amount of testimony or other proof must be supplied. When the testimony of the applicant is relied on, as is the case most frequently, it must be corroborated. Experience and fairness to the adversary have long since taught that application of that rule of caution is imperative. But as to what that corroboration must be, there is no rule. The corroboration may lie in the testimony of others, in documents, in events or in a wide variety of combinations of these three. The corroborating evidence does not have to directly confirm the testimony of the inventor. It need only *tend* to confirm. All that is necessary is that it shall corroborate adequately so that the proof as a whole is convincing.

In the instant case the sodium sulphide experiments performed by Cunningham in August, 1934, and in April, 1935 (particularly April experiments #1367 and #1368) were not isolated experiments but were an integral part of an exploratory research project. The more significant tests on this project are *summarized as a group* in Cunningham's final November report (Appellant's App. 231-239) which again describes in detail, and thus reflexively corroborates, the April experiments #1367 and #1368. This comprehensive November report had passed out of Cunningham's control long before the present controversy originated.

The testimony of Cunningham, concerning the sodium sulphide experiments carried out by him prior to the first of May, 1935, describes not merely the exact procedure followed but also the nature of the phenomena observed when the described procedure was followed. Cunningham's contemporaneous laboratory notebook records of these April experiments are similar in this respect. They also described not merely the exact procedure employed but in addition the nature of the phenomena observed.

These laboratory notebook records, as Taylor testified (Appellant's App. 29-30, 142-143), are original, contemporaneously prepared, carefully preserved, permanent records of tests performed. They are a type of record that is regularly kept as a part of the regular duty of every research chemist in the employ of the Mathieson Alkali Works in conducting the business of the research department of the Mathieson Alkali Works. They are the property of the Mathieson Alkali Works. They are retained by the company and are referred to and relied upon even after the party who performed the experiments recorded therein has left the employ of the company and is no longer available. Therefore, they are not to be viewed with the same suspicion as isolated sketches or notes the previous existence of which is known only to the person whose testimony they are supposed to corroborate. Indeed they are subject to even less suspicion than permanent notebook records that are regularly kept by an inventor *but solely or primarily for his own benefit.* Instead they are a type of writing that is expressly excepted from the hearsay rule and made *evidence of the acts recorded therein* under the specific provisions of U. S. Code, Title 28, Section 695.

The contemporaneous notebook records of Cunningham's April experiments might be less forceful evidence if they had stated merely that sodium sulphide had been *successfully prepared* by reacting sodium amalgam with an aqueous solution of sodium polysulphide. Instead, however, they describe the detailed procedure followed and the incidental phenomena observed, such as the incidental formation of mercury sulphide as an impurity and the elimination of mercury sulphide as an impurity in the final sodium sulphide product by the simple expedient of continuing to add sodium amalgam. That these incidental phenomena *actually do occur* exactly as described in Cunningham's testimony and in his notebook entries is confirmed by the stipulated testimony of Lanzetti concerning tests performed by the latter in Italy (Appellant's App. 317-318).

The record includes no contradiction of Taylor's expert testimony that these incidental phenomena could not have been predicted without actually carrying out the experiments (Appellant's App. 28-29, 33-34, 39).

Further evidence, in corroboration of Cunningham's testimony concerning performance of the tests in question prior to June 15, 1935, is supplied by Taylor's testimony to the effect that prior to June 11, 1935 (when Taylor signed the report of that date) Taylor himself had knowledge of the nature of *both the incidental phenomena and the basic reaction* that occur when sodium amalgam is reacted with an aqueous solution of sodium polysulphide; having previously derived such information both from his conferences with Cunningham and from Cunningham's notebook records.

The report signed by Taylor on June 11, 1935, and the testimony of Taylor concerning the nature and extent of his familiarity with Cunningham's experimental work on the sodium sulphide process prior to this date, are entitled to substantial weight for several reasons. In the first place Cunningham's April experiments, and Taylor's conferences with Cunningham and with Gage concerning this work, antedated the signing of the Taylor report of June 11, 1935 by only a few weeks. Accordingly, there is no reason to assume that the facts were not fresh in Taylor's mind when he signed the report. In the second place the report shows recognition of the serious commercial problem then confronting the Mathieson Alkali Works and makes specific recommendations supported by specific representations as to the progress already made by Cunningham on his sodium sulphide process.

Because of the serious consequences if these recommendations proved erroneous, the making of such recommendations and of specific representations in support thereof, by a man in the position of responsibility then occupied by Taylor, would have involved gross dereliction of duty if the recommendations and supporting representations had been made without substantial knowledge of the accuracy of the supporting representations. Taylor has testified that he did have very extensive knowledge of Cunningham's tests, including checking the method of analysis and checking the calculations to determine the yield of sodium sulphide. Similarly, in view of his knowledge of the seriousness of the general commercial situation then confronting the Mathieson Alkali Works, the representations made by Cunningham

(1) in his contemporaneous notebook records,

(2) in his monthly progress reports, and

(3) in his conferences with Taylor and with Gage in the late spring of 1935,

all would have involved wilful and serious misrepresentations if they had departed from the truth or if they had been unfounded.

Accordingly, in our submission, it is inescapable that one must either conclude that *in the spring of 1935* Cunningham did carry out the tests (1) described in his testimony, (2) described in his contemporaneous notebook entries, (3) described to Taylor in their conferences during the spring of 1935, (4) described by Taylor in the report of June 11, 1935, and (5) reviewed in Cunningham's final November report, or, alternatively conclude (a) that the testimony of both Cunningham and Taylor involved wilful perjury, (b) that both Cunningham and Taylor made serious and deliberate misrepresentations to their superiors in the spring of 1935, (c) that Cunningham deliberately falsified the permanent records of the company, and (d) that Cunningham was an adept clairvoyant who accurately predicted, in advance of tests, the several previously unknown phenomena *now known to occur* when sodium amalgam containing progressively increasing amounts of sodium is mixed with an aqueous solution of sodium polysulphide.

In the instant case there is nothing in the records to discredit the testimony of either Cunningham or Taylor. No tribunal has suggested that there is any suspicion of perjury. Indeed in this case the lack of corroboratory testimony *of the type the Board and the District Court appear to have regarded as essential,* arises primarily from the meticulous exactness of Taylor's testimony. Few witnesses who had as extensive and intimate familiarity with a group of tests as did Taylor with the tests performed by Cunningham in the spring of 1935, would have hesitated to testify, affirmatively *and without any qualifications or explanations,* that of their own knowledge the tests in question were carried out exactly in the manner and at the time described by Cunningham and that of their own knowledge the results described by Cunningham had in fact been obtained at that time.

The District Court appears to have placed great weight on the circumstance that Cunningham's testimony was by deposition and the further circumstance that there was no cross-examination of Cunningham notwithstanding the provision of an opportunity for such cross-examination. Indeed the District Court appears to have regarded these circumstances as rendering Cunningham's testimony so wholly incompetent that no "lesser degree of corroboration" than complete independent proof would suffice to corroborate it. This we submit was improper.

In an interference proceeding all testimony is by deposition since the Patent Office rules of practice so provide. In the present case adequate notice of the intention to take the testimony of Cunningham and an invitation to attend and cross-examine, as is required by the Patent Office rules of practice, was served upon (and receipt thereof acknowledged by) counsel for Lanzetti (Appellant's App. 117-118). Cunningham's deposition was taken in the town in which counsel for Lanzetti maintained its office. Failure of Lanzetti's counsel to attend and cross-examine under these circumstances merely creates the presumption that the testimony could not have been shaken by cross-examination, 5 Wigmore, Evidence (3d ed. 1940), Secs. 1371, 1378.

In the present type of action, the Statute (U. S. Code, Title 35, Section 63) specifically provides

> "* * * where there are adverse parties the record in the Patent Office shall be admitted in whole or in part, on motion of either party, subject to such terms and conditions * * * and the further cross-examination of the witnesses as the court may impose, without prejudice, however, to the right of the parties to take further testimony."

It further provides that:

> "The testimony and exhibits, or parts thereof, of the record in the Patent Office when admitted shall have the same force and effect as if originally taken and produced in the suit."

Accordingly, since the deposition of Cunningham in the Patent Office proceeding appeared to be complete and not to require supplementing, there appeared to be no occasion for appellant to recall Cunningham at the trial of this case before the District Court. Counsel for appellee at the trial offered no objection to the admission of the deposition of Cunningham (Appellant's App. 25). Neither before the trial nor at the trial before the District Court did counsel for appellee request that Cunningham be recalled in order to permit cross-examination. Neither did counsel for appellee make any attempt on his own accord to further examine Cunningham, although the statute here applicable expressly grants him the right to do so.

We submit in the present case that Cunningham's testimony is competent, that it is entitled to special consideration because of the relatively short period of time intervening between performance of the acts described and his testimony with respect thereto and because of the abundance and complete character of the contemporaneous documentary evidence available to refresh his recollection. The corroborating evidence is so strong that it raises only one inference, namely, that Cunningham actually did perform the tests of August, 1934 and April, 1935 described in his testimony and recorded in his notebooks; thereby accomplishing a reduction to practice as of a date at least as early as April, 1935.

The Rule of the Board of Appeals re Corroboration

The rule followed by the Board of Appeals in the present case, and with reservations by the District Court, has been asserted by the Board of Appeals to be a rule of general application. It is a rule asserted to be applicable regardless of the high character of the witnesses or the persuasiveness of the testimony of the inventor. Concisely stated, this rule is to the effect that neither circumstantial evidence nor writings of the special type that are by statute made admissible *as evidence of the acts recorded therein* are competent in corroboration of the testimony of an inventor on the question of reduction to practice.

This rule appears to have some support in recent decisions of the Court of Customs and Patent Appeals as is indicated by the successive opinions of that Court in *Collins* v. *Olsen,* 26 C. C. P. A. 1017, in *Bainbridge* v. *Walton,* 26 C. C. P. A. 1417 and in *Crane* v. *Carlson,* 29 C. C. P A. —, 125 F. (2d) 709. However, even the Court of Customs and Patent Appeals has acknowledged that there may be exceptions to this general rule in its broadest aspect, and it has never applied such a rule where the facts parallel those established by the evidence in this case.

For instance in the recent opinion of the Court of Customs and Patent Appeals in the *Crane* v. *Carlson* case the Court reviewed and quoted from several of its earlier opinions, starting with the *Collins* v. *Olsen* case, all of which employed broad general language tending to justify the erroneous rule applied by the Board in the present case. In the opinion in the *Crane* v. *Carlson* case the Court said:

> "In our opinion [in Collins v. Olsen] we said:
>
> > 'We must conclude that statements in reports by Olsen, no matter how clear, as to what he used, what he did and what the results were, cannot be accepted as proof of reduction to practice, unless fully corroborated, even though such reports were made to an official who had such confidence in their accuracy that he was willing to act upon them without complete and independent investigation. While they constitute good evidence of conception, they are self-serving on the question of reduction to practice.'
>
> "In the case of George v. Karsel [citation] we said:
>
> > 'This is one of those cases where the testimony of the inventor himself is persuasive; but the rule requiring corroboration of the testimony of an inventor in cases like that at bar is firmly established in patent law and upon the whole is a very salutary rule.'
>
> "A like observation is applicable to the case at bar. All of the witnesses appear to be men of high character, and the testimony of appellant, together with his notebook and time cards, is very persuasive; but unless there be *independent* corroboration of his testimony respecting actual reduction to practice, no award of priority based upon such actual reduction may be made.

> "In the case of Akers v. Papst [citation] in discussing the question of actual reduction to practice of an invention, we said:
>
> > 'It is no reflection upon appellant's testimony to hold that corroboration is required. Such corroboration in interference proceedings is a positive rule of patent law.'
>
> * * * * * *
>
> "All of the observations above quoted are applicable here, and regardless of the high character of appellants and the persuasiveness of their testimony, we are bound by the well-established rule of patent law that *independent* corroboration of the testimony of inventors is essential to establish actual reduction to practice of an invention, and that reports, official or otherwise, which are self-serving statements, cannot be considered as corroborative evidence of such reduction to practice.
>
> "It is unfortunate that many inventors are not aware of this rule of law." (Emphasis ours).

We do not suggest that the decisions ultimately reached were not justified in certain of the cases in which the opinions of the Court of Customs and Patent Appeals have employed broad language implying that circumstantial evidence is wholly incompetent on the question of reduction to practice. Thus in the *Collins* v. *Olsen* case there were numerous surrounding circumstances recited at length in the decision (e. g., the admitted inability of others to duplicate the results of the alleged experiments, and the subsequent publication of magazine advertisements inconsistent with accepted knowledge of the invention) which tended to cast doubt on the complete and successful character of the alleged reduction to practice. Likewise in the *Crane* v. *Carlson* case, it does not appear from the decision that the writings (notebook entries and report) offered in corroboration of the testimony of the inventors contained any description of the procedural details of the test alleged to be a reduction to practice or of the phenomena observed, or that these writings went any further than merely to assert the inventor's conclusion that the test "was satisfactory".

However the *Bainbridge* v. *Walton* case illustrates the extreme breadth and general application of the erroneous rule adopted by the Board of Appeals. Moreover the express refusal of the Court in that case to deny the propriety of the general rule there stated by the Board, appears to have been since treated by the Board as an affirmance of the general rule itself. In that case the testimony of the inventor was supported by compelling circumstantial evidence and the several inconsistent circumstances involved in the many other cases were not present. The invention in that case was a photo-electric tube. The inventor testified as to having built and tested this tube at a certain date and in corroboration there was offered a proven contemporaneous report including charts containing curves illustrating the peculiar performance of the new type of tube.

At a much later date a witness other than the inventor tested the same tube exactly in the manner described in the report. The data he obtained, when plotted in charts as curves, showed the same peculiar performance characteristics as those appearing in the original report.

On the basis of these facts the majority opinion of the Patent Office Board of Appeals held that the testimony of the inventor was not corroborated *because the evidence offered in corroboration, although convincing, was circumstantial.* In that part of the opinion of the Board quoted by the Court (26 C. C. P. A. 1417, 1420), the Board said:

> "Appellant contends that since Dr. Koller tested out in 1935, the tube used by Bainbridge in 1928 and got the same results as Bainbridge, then Bainbridge's Summer Report must be accepted as evidence of successful reduction to practice. It is conceded that this argument is a plausible one and *it is very improbable that Bainbridge could have plotted the curve shown in the Summer Report unless it was based on actual tests and the tests, Exhibit N, conducted by Doctor*

> *Koller at the time of taking testimony, tend to strengthen this assumption.*
>
> * * * *
>
> "At best, appellant is asking us *to accept circumstantial evidence in lieu of the direct positive testimony* called for by the long established practice. We do not believe that we would be warranted in doing so." (Emphasis ours).

However, one of the members of the Board of Appeals wrote a short but cogent and thoroughly sound dissenting opinion which read as follows:

> "It is incredible to me that the party Bainbridge could have prepared the first set of charts, with substantially the same curves as those of the second set, if he did not test the tube. I know of no hard and fast rule that circumstantial evidence cannot be relied upon for corroboration in an interference proceeding.
>
> "If evidence of this character can be accepted as proof sufficient to justify a death sentence, I can see no reason why it cannot be relied upon in cases of this nature. In this case I believe that the evidence offered is much more persuasive than direct testimony of the character usually presented.
>
> "I believe this to be an unusual situation and I think that the later tests should have been accepted as corroborating the party Bainbridge's earlier record."

On further appeal the Court of Customs and Patent Appeals cited its prior decision in the *Collins* v. *Olsen* case and sustained the majority opinion of the Board, although it expressly refused to confirm or to deny the broad rule asserted by the Board. In its opinion the Court said:

> "Without intending to be understood as expressing any opinion as to whether such evidence could under any circumstances be considered corroborative in character, it is clear that it cannot be so considered here.
>
> * * * * * *
>
> "We do not mean to be understood as suggesting that appellant did not successfully reduce the inven-

> tion to practice in 1928. We merely hold that the evidence of record is insufficient to establish that he did."

The Court took particular note of appellant's contention that the peculiar performance chart appearing in the contemporaneous report could not have been prepared by appellant if he had not tested the tube, but rejected this contention on the stated ground that "there is *no* evidence of record to substantiate the argument". (Emphasis ours).

We direct attention to the fact that the last-mentioned criticism of the evidence in the *Bainbridge* v. *Walton* case does not apply in the present case, in view of the uncontradicted testimony of Taylor to the effect that knowledge of the incidental phenomena, shown to have been in the possession of both Cunningham and Taylor prior to the writing of Taylor's report of June 11, 1935, could not have been obtained except through a performance of the tests similarly described in the testimony of Cunningham and in his contemporaneous notebook records.

As to the kind of evidence that is competent in corroboration of the testimony of an inventor on reduction to practice, the Court of Customs and Patent Appeals appears to have based its policy of relying upon convenient rules of more or less general application, in lieu of the task of weighing the evidence as a whole and in the light of the burden of proof existing in each particular case, on the erroneous belief that it was bound to do so by precedent. Thus in the *Collins* v. *Olsen* case the decision of the Court of Customs and Patent Appeals cited four prior decisions of the Court of Appeals for the District of Columbia as establishing the broad rule that all types of contemporaneous writings and statements by an inventor are incompetent as evidence tending to corroborate the testimony of the inventor as to reduction to practice. No exception is made of those instances where the contemporaneous writings and statements clearly establish contemporaneous knowledge of unusual phenomena that obviously would have remained unknown unless the tests alleged to have been carried out had in fact been carried out.

These four decisions are:

Petrie v. De Schweinitz, 19 App. D. C. 386
Robinson v. Thresher, 28 App. D. C. 22
Daggett v. Kaufman, 33 App. D. C. 450
Sundberg et al. v. Schmitt, 58 App. D. C. 292.

However reference to these decisions will show that they do not afford any precedent whatever for the extreme rule, precluding acceptance of the testimony of the inventor if corroborated only by circumstantial evidence, implied by the broad language by the Court of Customs and Patent Appeals in the *Collins* v. *Olsen* case, and affirmatively stated by the Board of Appeals in still broader language in its opinions in the *Bainbridge* v. *Walton* case and in the present case. In each of the decisions of the Court of Appeals for the District of Columbia cited in the *Collins* v. *Olsen* case, the Court carefully weighed the testimony of the inventor in the light of the established surrounding circumstances and in the light of the burden of proof in that particular case, although it acknowledged the existence of the quite proper rule requiring corroboration. In none of these cases did the Court apply any different rule than that which it applied in the Armstrong case and in the *Kitchen* v. *Smith* case, or any different rule than that which was applied by the Supreme Court in the *Corona* case.

When this proper rule is applied to the evidence of the present case it can lead, we submit, to but one conclusion; namely, that the testimony of Cunningham and the overwhelming corroborating circumstantial evidence establish a reduction to practice by Cunningham as of a date prior to June, 1935, beyond a reasonable doubt.

Point 2

The question presented by this point is whether the evidence submitted on behalf of appellant establishes diligence by Cunningham and his assignee connecting his admitted conception prior to Lanzetti's Italian filing date with his admittedly diligent work subsequent to about the midde of August, 1935.

In the summary of the argument on this point we have pointed out that appellant must prevail even though Cunningham's work prior to June 15, 1935 is not treated as a reduction to practice, if Cunningham was diligent in the period intervening between June 14, 1935 and about August 15, 1935 because of his admitted prior conception.

Although the quantitative tests completed by Cunningham in April of 1935 had clearly established the operability and probable economic value of Cunningham's sodium sulphide process, Taylor had instructed Cunningham, at least as early as the first part of June, 1935, to proceed with further tests on this process to ascertain whether concentrated solutions could be made directly by the process. These additional tests were made by Cunningham upon returning from his vacation but in the intervening period Cunningham devoted that part of his time available for furtherance of the sodium sulphide project (1) to the task of making an independent estimate of the relative cost of making sodium sulphide by his new process and by the method of the prior art and (2) to the additional task of making an extensive literature search to ascertain whether basic patent protection could be obtained. Both of these activities deny any intent to abandon. Moreover, the latter task clearly constituted diligence directed toward a *constructive* reduction to practice.

Cunningham's conduct in performing these tasks at this stage in the development of his sodium sulphide process is not unreasonable. We submit this is shown by the stipulated testimony of Lanzetti concerning his own parallel activities in Italy. This stipulated testimony (Appellant's App. 320-321) points out that Lanzetti himself, following his preliminary quantitative experiments and *before* he began to devote time to "the study for obtaining sodium sulphide solutions at the highest possible concentration", suspended his laboratory work "in order to make the proper literature searches to establish the originality of my invention".

The stipulated testimony of Lanzetti also shows that the time required by Cunningham to complete these investigations was not unreasonable since according to the testimony of Lanzetti

> "This work [the literature searches and market study] took more time than the laboratory work which had been carried out up to that time * * *" (Appellant's App. 320-321).

In addition it should be borne in mind that it was not until Cunningham returned from his vacation that the several other projects being explored concurrently by Cunningham were laid aside. The commercial problem confronting the Mathieson Alkali Works at that time was the development of not one but a considerable number of new uses for sodium amalgam. Part of Cunningham's time during June, 1935, was devoted to this concurrent exploratory research as is shown by Cunningham's progress report for June, 1935 (Appellant's App. 196). However, only reasonable diligence is required and this does not involve uninterrupted effort nor the concentration of all of the applicant's energies upon the single enterprise, *Dickinson* v. *Swinehart,* 49 App. D. C. 222.

We think Cunningham's activities during the summer of 1935 were adequate under the law to sustain a finding that he was not lacking in diligence to an extent that would deprive him of the benefit of his admitted conception in the spring of 1935.

Point 3

The question presented by this point is whether the evidence establishes that Lanzetti is entitled to the benefit of the filing date of his Italian application.

The argument on this point appears to be adequately covered in the summary, except that we desire again to emphasize that appellee is in no position to ask for relaxation of the strict rules of evidence, with respect to proof of the identity of the disclosure of his Italian application as filed, *so long as he continues to urge adherence* to the harsh and erroneous rule precluding corroboration by circumstantial evidence which was applied by the Board of Appeals in the case of *Bainbridge* v. *Walton* and in this case.

Conclusion

We respectfully urge that appellant is entitled to the relief requested in the complaint and that the decision of the District Court should be reversed.

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L. D. Forward
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Of Counsel.

Appendix B

U. S. Code Title 28, Section 695

In any court of the United States and in any court established by Act of Congress, any writing or record, whether in the form of an entry in a book or otherwise, made as a memorandum or record of any act, transaction, occurrence, or event, shall be admissible as evidence of said act, transaction, occurrence, or event, if it shall appear that it was made in the regular course of any business, and that it was the regular course of such business to make such memorandum or record at the time of such act, transaction, occurrence, or event or within a reasonable time thereafter. All other circumstances of the making of such writing or record, including lack of personal knowledge by the entrant or maker, may be shown to affect its weight, but they shall not affect its admissibility. The term "business" shall include business, profession, occupation, and calling of every kind. (June 20, 1936, c. 640, Section 1, 49 Stat. 1561.)

U. S. Code Title 35, Section 32

* * * * *

An application for patent for an invention or discovery * * * filed in this country by any person who has previously regularly filed an application for a patent for the same invention, discovery, or design in a foreign country which, by treaty, convention, or law, affords similar privileges to citizens of the United States shall have the same force and effect as the same application would have if filed in this country on the date on which the application for patent for the same invention, discovery, or design was first filed in such foreign country: *Provided,* That the application in this country is filed within twelve months * * * from the earliest date on which any such foreign application was filed. * * * R.S. Section 4887; March 3, 1897, c. 391; Section 3, 29 Stat. 693; March 3, 1903, c. 1019, Section 1, 32 Stat. 1225; June 19, 1936, c. 594, 49 Stat. 1529; Aug. 5, 1939, c. 450, Section 1, 53 Stat. 1212.

U. S. Code Title 35, Section 63

Whenever a patent on application is refused by the Board of Appeals or whenever any applicant is dissatisfied with the decision of the board of interference examiners, the applicant, unless appeal has been taken to the United States Court of Customs and Patent Appeals, and such appeal is pending or has been decided, in which case no action may be brought under this section, may have remedy by bill in equity, if filed within six months after such refusal or decision; and the court having cognizance thereof, on notice to adverse parties and other due proceedings had, may adjudge that such applicant is entitled, according to law, to receive a patent for his invention, as specified in his claim or for any part thereof, as the facts in the case may appear. * * * In all suits brought hereunder where there are adverse parties the record in the Patent Office shall be admitted in whole or in part, on motion of either party, subject to such terms and conditions as to costs, expenses, and the further cross-examination of the witnesses as the court may impose, without prejudice, however, to the right of the parties to take further testimony. The testimony and exhibits, or parts thereof, of the record in the Patent Office when admitted shall have the same force and effect as if originally taken and produced in the suit. R.S. Section 4915; February 9, 1893, c. 74, Section 9, 27 Stat. 436; March 2, 1927, c. 273, Section 11, 44 Stat. 1336; March 2, 1929, c. 488, Section 2(b), 45 Stat. 1476; August 5, 1939, c. 451, Section 4, 53 Stat. 1212.

U. S. Code Title 35, Section 72

Whenever it appears that a patentee, at the time of making his application for the patent, believed himself to be the original and first inventor or discoverer of the thing patented, the same shall not be held to be void on account of the invention or discovery, or any part thereof, having been known or used in a foreign country, before his invention or discovery thereof, if it had not been patented or described in a printed publication. R.S. Section 4923.

APPENDIX TO BRIEF FOR APPELLANT

IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA.

JANUARY TERM, 1942.

UNITED STATES
COURT OF APPEALS FOR THE
DISTRICT OF COLUMBIA

FILED SEP 17 1942

Joseph W. Stewart

CLERK

No. 8220

THE MATHIESON ALKALI WORKS, INC., *Appellant,*

v.

LUIGI ACHILLE.

Appeal from the District Court of the United States for the District of Columbia

Filed April 4, 1942.

RAYMOND F. ADAMS,
LOUIS D. FORWARD,
CLARENCE M. FISHER,
Attorneys for Appellant.

PRESS OF BYRON S. ADAMS, WASHINGTON, D. C.

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IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA.

JANUARY TERM, 1942.

No. 8220.

THE MATHIESON ALKALI WORKS, INC., *Appellant,*

v.

LUIGI ACHILLE.

Appeal from the District Court of the United States for the District of Columbia

Filed April 4, 1942.

APPENDIX TO BRIEF FOR APPELLANT

District Court of the United States for the District of Columbia

Civil Action No. 3309

THE MATHIESON ALKALI WORKS, INC., *Plaintiff,*

v.

LUIGI ACHILLE, *Defendant.*

United States of America,
District of Columbia, ss:

BE IT REMEMBERED, that in the District Court of the United States for the District of Columbia, at the City of Washington, in said District, at the times hereinafter mentioned, the following papers were filed and proceedings had, in the above-entitled action, to wit:

1 In the District Court of the United States for the District of Columbia

Civil Action No. 3309

Action under Title 35, Sec. 63, U. S. Code (Revised Statutes, Section 4915 as amended)

The Mathieson Alkali Works, Inc., *Plaintiff,* 60 E. 42nd St., New York, N. Y.

vs.

Luigi Achille, *Defendant,* 4 Via Bazzini, Milan, Italy

Complaint for Issuance of Letters Patent

To the Honorable the Judges of the District Court of the United States for the District of Columbia:

The plaintiff alleges as follows:

I. The plaintiff, The Mathieson Alkali Works, Inc., is a corporation duly organized and existing under the laws of the State of Virginia, having an office and established place of business at 60 East 42nd Street, New York, New York; and is the sole owner of record of the entire right, title and interest in and to an original application for United States Letters Patent, Serial No. 62,308, entitled Chemical Manufacture, filed in the United States Patent Office on February 4, 1936 by George Lewis Cunningham, which was deemed to be in interference with certain claims in an application for United States Letters Patent filed by Enzo Lanzetti, assignor to defendant, as hereinafter set forth.

II. Plaintiff is informed and believes and therefore alleges that the defendant, Luigi Achille, resides at 4 Via Bazzini, Milan, Italy, and is the sole owner of record of the entire right, title and interest in and to a certain application for United States Letters Patent filed in the United
2 States Patent Office by Enzo Lanzetti on April 15, 1936, Serial No. 74,592, entitled Process for Producing Alkali Metal Sulfides.

III. This complaint is brought under and pursuant to the Patent Laws of the United States, Title 35, Sec. 63, U. S. Code, (Revised Statutes, Section 4915 as amended) and the jurisdiction of this Court is based upon Title 35, Sec. 72a, U. S. Code.

IV. Plaintiff is informed and believes and therefore alleges that prior to the 4th day of February, 1936, plaintiff's assignor, George Lewis Cunningham, was the original, first and sole inventor of certain new and useful improvements in Chemical Manufacture, not known or used by others in this country prior to his invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country prior to his said invention or discovery thereof, or more than two years prior to his application for patent therefor, hereinafter referred to, and not in public use or on sale in this country prior to his invention or discovery thereof, or more than two years prior to his application for Letters Patent therefor, as hereinafter set forth, and for which inventions no application for Letters Patent had been filed by him or his legal representatives or assigns in any foreign country more than twelve months prior to his said application for Letters Patent, and which said inventions had not then and have not since been abandoned.

V. On the 4th day of February, 1936, the said George Lewis Cunningham, made application for Letters Patent of the United States for his said improvements or in-
3 ventions in Chemical Manufacture to the Commissioner of Patents of the United States, his said application being serially numbered 62,308, said application com-

plying in all respects with the requirements of law and the rules of the Patent Office in such cases made and provided.

VI. By an assignment in writing, executed on the 30th day of January, 1936, said George Lewis Cunningham, being then the sole owner of said improvements or inventions, duly assigned to the plaintiff, The Mathieson Alkali Works, Inc., the entire right, title and interest in and to said improvements and in and to said application Serial No. 62,308 and requested the Commissioner of Patents to issue Letters Patent on said application to the plaintiff, The Mathieson Alkali Works, Inc., as will more fully appear from the original of said assignment ready here in Court to be produced.

VII. The plaintiff, The Mathieson Alkali Works, Inc., is now and has been ever since said assignment, sole owner of said improvements and inventions and of said application Serial No. 62,308.

VIII. Plaintiff is informed and believes, and therefore alleges, that by an instrument dated March, 1936, duly executed and delivered, and recorded on April 15, 1936 in the United States Patent Office, Liber L-166, Page 700, of the Transfer of Patents, the defendant, Luigi Achille, acquired and is now the sole owner of the entire right, title and interest in and to the aforesaid application of said Enzo Lanzetti, Serial No. 74,592, and the inventions as described therein, as will more fully appear from said assignment or duly authenticated copy thereof ready in court to be produced.

4 IX. The said application of George Lewis Cunningham, Serial No. 62,308, was duly prosecuted in accordance with the laws of the United States and the rules of the Patent Office and on or about the 7th day of January, 1937, after the examination required by law and other due proceedings had, the Commissioner of Patents adjudged that the invention described and claimed in said application for Letters Patent serially numbered 62,308 in part interfered with a certain other application for Letters Patent then pending

in the United States Patent Office; namely, an application for patent of Enzo Lanzetti, Serial No. 74,592, filed April 15, 1936, for process of producing alkali metal sulfides, assigned to defendant, Luigi Achille, the said interference being designated and known as Interference No. 73,765.

X. The subject matter of said Interference No. 73,765 was defined by the Commissioner of Patents in three interference counts which corresponded in all respects to claims 12, 13 and 14 of said application of George Lewis Cunningham, Serial No. 62,308 and to claims 12, 13 and 14 of said application of Enzo Lanzetti, Serial No. 74,592, and said counts were as follows:

1. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulphide.

2. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal sulphide and sulphur.

3. The process of producing an alkali metal sulphide which comprises reacting an alkali metal amalgam containing a fraction of 1% of the alkali metal with an aqueous solution of the corresponding alkali metal polysulphide.

5 XI. Thereupon, after due proceedings had upon the issue of priority of invention of the improvements constituting the subject matter of said interference, the Examiner of Interferences, acting on the authority of the Commissioner of Patents, awarded priority of invention of the subject matter of counts 1, 2 and 3 of the interference, erroneously, as plaintiff alleges, to Enzo Lanzetti.

XII. Thereafter appeal was duly taken on behalf of George Lewis Cunningham to the Board of Appeals of the United States Patent Office from the decision of the Examiner of Interferences.

XIII. After hearing the arguments and considering the briefs filed by each of said applicants, respectively, the said Board of Appeals, acting on the authority of the Commissioner of Patents, entered a decision dated February 14, 1939, affirming erroneously, as plaintiff alleges, the decision of the Examiner of Interferences with respect to counts 1, 2 and 3 of Interference No. 73,765, and erroneously awarding priority of invention of counts 1, 2 and 3 to Enzo Lanzetti, from which decision no appeal to the Court of Customs and Patent Appeals has been taken, is pending or has been decided; said decision of the Board of Appeals was delivered within six months prior to the filing of this complaint, and constitutes a refusal by the Commissioner of Patents to grant a patent to plaintiff, The Mathieson Alkali Works, Inc., on said application of George Lewis Cunningham for the inventions defined by counts 1, 2 and 3 of said interference.

XIV. Conseqeuently the Commissioner of Patents has refused and still refuses to grant Letters Patent upon the aforesaid application of George Lewis Cunningham, for the invention or inventions embraced in the claims here-
6 inbefore recited, all as will more clearly appear from duly authenticated copies of said application of George Lewis Cunningham, Serial No. 62,308 and of the aforesaid proceedings in the Patent Office, ready in Court to be produced, and said refusal is unlawful.

Wherefore, the plaintiff, The Mathieson Alkali Works, Inc., prays this Honorable Court:

First, to adjudge and decree that George Lewis Cunningham, is the true, original, first and sole inventor of the subject matter of counts 1, 2 and 3, hereinbefore recited and each of them.

Second, to adjudge and decree that the plaintiff, The Mathieson Alkali Works, Inc., as assignee of all right, title and interest in and to the said inventions and application of George Lewis Cunningham, is entitled, according to law, to receive Letters Patent of the United States for such inventions.

Third, to authorize and direct the Commissioner of Patents to issue to plaintiff, The Mathieson Alkali Works, Inc., Letters Patent of the United States, embodying said counts hereinbefore recited upon filing in the United States Patent Office of such adjudication, and upon compliance with the requirements of the law in such cases made and provided.

Fourth, that the defendant be decreed to pay the costs and disbursements of this suit.

THE MATHIESON ALKALI WORKS, INC.,
By HOWARD BERRY
Vice President

CLARENCE M. FISHER
Attorney for Plaintiff
834 National Press Bldg., Wash., D. C.

RAYMOND S. ADAMS,
WM. S. EDWARDS,
Of Counsel

7 *Verification*

STATE OF NEW YORK
County of New York, ss.

Howard Berry, being duly sworn, deposes and says, that he is the Vice President of The Mathieson Alkali Works, Inc., the plaintiff herein; that he has read the foreging complaint and knows the contents thereof, and that the same is true to his own knowledge; except as to the matters stated to be alleged upon information and belief, and as to those matters he believes it to be true.

Deponent further says that the reason this verification is made by deponent and not by said The Mathieson Alkali Works, Inc., is because the said The Mathieson Alkali Works, Inc., is a corporation, and that the grounds of deponent's belief as to all matters in the said complaint not stated upon his own knowledge are investigations which deponent has caused to be made concerning the subject matter, and information acquired by deponent in the course of his duties as an officer of the said The Mathieson Alkali

Works, Inc., and from the books and papers of said corporation.

HOWARD BERRY

Subscribed and sworn to before me this 28th day of June, 1939.

A. P. WINSOR,
Notary Public

Notary Public, Westchester County
New York Co. Clk.'s No. 417, Reg. No. 1W288
Commission Expires March 30, 1941

8 Endorsed: Filed Oct 30 1939 Charles E. Stewart, Clerk

In the United States District Court for the District of Columbia

Civil Action No. 3309

THE MATHIESON ALKALI WORKS, INC., *Plaintiff*,

v.

LUIGI ACHILLE, *Defendant.*

Answer to Complaint

To the Honorable the Judges of the District Court of the United States for the District of Columbia:

The Defendant for its answer to the Complaint in this case verified on or about June 28th, 1939, alleges as follows:

1. Answering Paragraph IV of the Complaint, defendant denies each and every allegation thereof.
2. Answering Paragraph V of the Complaint, Defendant denies that said application complied in all respects to the requirements of law and the rules of the Patent Office in such cases made and provided, and it further denies that said George Lewis Cunningham made any improvements or inventions subject to patent protection by the United States.

3. Answering Paragraphs I, VI, and VII of the Complaint, the allegations therein are peculiarly within the knowledge of the Plaintiff and Plaintiff leaves Defendant to its proof of such allegations and, therefore, denies the same.

9 4. Answering Paragraph IX of the Complaint, Defendant denies that such application was duly prosecuted in accordance with the laws of the United States and the rules of the Patent Office and also denies that there was an examination required by law and other due proceedings, and also denies there was any invention disclosed in application, Serial No. 62,308, subject to patent protection in the United States.

5. Answering Paragraph XI of the Complaint, Defendant denies each and every allegation thereof except that the Examiner of Interferences awarded priority of invention to Enzo Lanzetti and Defendant alleges that such an award was a proper one and not erroneous.

6. Answering Paragraph XIII, Defendant denies each and every allegation thereof except that said Board of Appeals entered a decision dated February 14, 1939, affirming a decision of the Examiner of Interferences awarding priority to Enzo Lanzetti and that no appeal was taken to the Court of Customs and Patent Appeals and Defendant further alleges that such affirmance was proper and not erroneous.

7. Answering Paragraph XIV of the Complaint, Defendant denies each and every allegation thereof.

10 *And By Way of Separate, Independent and Distinct Defenses*

8. Defendant alleges, pursuant to Rule 12(b) that the present Court has lack of jurisdiction over the subject matter and over the person of the defendant, that the venue is improper, that the process and service of process is insufficient and that the Complaint fails to state a claim upon which relief may be granted by this Court and Defendant

denies jurisdiction of this Court as alleged in Paragraph III of the Complaint.

9. Defendant further alleges that George Lewis Cunningham is not entitled to any patent of the United States for any of the subject matter of his application, Serial No. 62,308, filed February 4, 1936, because of the prior invention of the subject matter thereof by said Enzo Lanzetti which is disclosed in his application, Serial No. 74,592, filed April 15, 1936, and having an effective Italian filing date of June 15, 1935. The circumstances surrounding this prior invention are fully set forth and described in the affidavits filed in the United States Patent Office on or about April 1, 1938, which are made Defendant's Exhibit A, and form part of this Answer.

Wherefore, Defendant Prays that the Complaint be dismissed and that Enzo Lanzetti be adjudged the true, original, first and sole inventor of the subject matter of Counts 1, 2 and 3, and that the Plaintiff be decreed to pay the costs of disbursements of this suit and that the Commissioner of Patents be authorized and directed to issue to the Defendant a patent on said application of Enzo Lanzetti.

11 *And By Way of Counterclaim*

10. This Counterclaim arises pursuant to provisions of Rule 13, and also pursuant to Revised Statutes 274-D, and it relates to claims arising out of the transactions and occurrences forming the subject matter of the Complaint and it does not require for its adjudication the presence of third parties of whom the Court cannot acquire jurisdiction.

11. Defendant herein has been held by the Commissioner of Patents, acting through the Examiner of Interferences and the Board of Appeals, to be entitled to a patent on the subject matter of the application of Enzo Lanzetti Serial No. 74,592, and issuance of said patent has been and is being withheld and/or has been delayed because of the said Interference No. 73,765, the proceedings of which interference are kept pending by Plaintiff and its agents, all to the serious loss and injury of the Defendant.

12. In the meanwhile, Plaintiff, through itself or its associates, is experimenting with, developing or using the process set forth in the Counts of said interference, as set forth more particularly in Paragraph X of the Complaint and not only is Plaintiff not paying royalties to Defendant for use of the subject matter of these counts, but in view of the delay in issuance of the patent to Defendant, because of the interference proceedings, it has been made difficult and impossible for Defendant to realize any profit, royalty or income from the invention of said Enzo Lanzetti covered in said counts or to secure a patent under which licenses could be granted.

12 13. During the taking of testimony in behalf of George Lewis Cunningham, on or about November 4, 1937, no appearance was made in behalf of Enzo Lanzetti and no objection was made to any testimony introduced in behalf of George Lewis Cunningham and George Lewis Cunningham was free to introduce any and all testimony and evidence in his behalf. No testimony, however, was introduced of others to corroborate reduction to practice of Cunningham and although Cunningham stated he disclosed his ideas to others, he did not state or introduce any testimony to show other persons were actually present during the experiments relied upon to establish a reduction to practice. Moreover, the testimony indicated that the corroborating witnesses, Taylor and Gage, did not observe Cunningham's experiments, but merely read regularly written reports supplemented by informal discussions. The testimony and evidence introduced in behalf of Cunningham showed a complete absence of corroboration of the experiments Cunningham made prior to his date of filing. Moreover, the record and testimony in behalf of Cunningham shows that neither Cunningham nor the Plaintiff herein was diligent in reducing the invention to practice during or after July, 1935, prior to the filing date of Cunningham's application, but were principally interested during that time in the commercialization aspects and the economical aspects of the Cunningham process. Cunningham and the Plaintiff

herein cannot introduce any further testimony or evidence which they were not free to introduce in the proceedings before the Patent Office.

13 14. Defendant further alleges that even though any further testimony be introduced, such further testimony or evidence will not be prior to the Italian filing date of June 15, 1935, nor prior to the dates of invention of Enzo Lanzetti, more fully set forth in Exhibit A, referred to above, and in view of the holding of Electric Storage Battery Co. v. Genzo Shimadzu et al., decided by the Supreme Court on or about April 17, 1939 (41 U. S. P. Q. 155), Enzo Lanzetti is entitled to the date set forth in said affidavits included in Exhibit A.

Wherefore, Defendant Prays for a declaratory judgment from this Court declaring that Enzo Lanzetti is the first, true and sole inventor of the subject matter of Counts 1, 2 and 3, of Interference No. 73,765; that Enzo Lanzetti is entitled to the early dates set forth in Exhibit A, as his date of invention; that Plaintiff be held to have infringed or used or trespassed upon the subject matter of said Counts; that Plaintiff be caused to account for all damages Defendant has suffered and all profits Plaintiff has made; that Plaintiff and all those acting in its behalf be restrained and enjoined from further infringement or use of the subject matter of said Counts; that Defendant be awarded its costs and disbursements and that Defendant be given such other and further relief as may seem just and proper.

LUIGI ACHILLE
By HARRY PRICE
Attorney for Defendant
274 Madison Avenue
New York City, N. Y.

HENRY H. BENJAMIN
HENRY HOBART BENJAMIN
1416 F Street, Northwest
Washington, D. C.
Resident Solicitor.

October 27, 1939.

14 Endorsed: Filed July 7 1941 Charles E. Stewart Clerk

Civil Action No. 3309

Mathieson Alkali Works

v.

Achille

The main question in this case is whether the plaintiff's assignor, George Lewis Cunningham, reduced the process involved in this case to practice before the filing date of the defendant's application, June 15, 1935. I agree with the Board of Appeals of the Patent Office that the testimony of Cunningham together with certain note books are sufficient to show a conception of the invention before any date that can be awarded to the defendant. The Board of Appeals further held, apparently as a matter of law that the evidence referred to in corroboration of Cunningham's testimony was merely hearsay so far as the performance of the invention was concerned, and as there was no witness other than Cunningham who actually saw the carrying out of the process, the contention of Cunningham that he had actually carried out the process at the time that he claimed
15 to do so was not sustained.

Without holding that this result must follow as a matter of law, I do not think that the evidence introduced in the Patent Office and before me is sufficient to sustain the plaintiff's position. I do not decide whether or not the Court might not be so impressed by the manner of testifying before it of an inventor as to require some lesser degree of corroboration, but in the instant case the inventor's testimony was by deposition and without cross examination, and the additional testimony had before me at the hearing does not alter my opinion.

I also agree with the views of the Board of Appeals on the question of Cunningham's diligence, and the complaint should be dismissed with costs.

As is the counterclaim I do not think that a present controversy exists as between the parties, other than that which will be settled by the result of the present suit.

16 The cross-complaint and supplemental cross complaint should be dismissed without prejudice as to the issues raised in it, in the event litigation should hereafter arise involving any of them.

BAILEY
J

17 Endorsed: Filed Dec 9 1941 Charles E. Stewart Clerk

In the District Court of the United States for the District of Columbia

Civil Action No. 3309

THE MATHIESON ALKALI WORKS, INC., *Plaintiff*,

v.

LUIGI ACHILLE, *Defendant*.

Findings of Fact

1. This is a civil action brought under the provisions of Section 4915 R. S. (U. S. C., Title 35, Sec. 63). In the complaint it is prayed that George Lewis Cunningham be adjudged the first inventor of the subject matter defined in three claims recited in the complaint, and that the Commissioner of Patents be authorized to issue to plaintiff, as assignee of an application of said Cunningham, a patent containing said claims.

2. The plaintiff, the Mathieson Alkali Works, Inc., is the assignee of an application for Letters Patent of the United States filed by George Lewis Cunningham on February 4, 1936, Serial No. 62,308.

3. The defendant, Luigi Achille, is the assignee of an application for United States Letters Patent, Serial No. 74,592, filed April 15, 1936 by Enzo Lanzetti.

4. Lanzetti filed an application in Italy on June 15, 1935, and a patent thereon was issued to him in Italy on October 10, 1935. In this application was disclosed the same processes as those disclosed in his American Application and in the Cunningham application above referred to.

5. The Cunningham application, Serial No. 62,308 and Lanzetti application No. 74,592, were copending in the United States Patent Office. Both applications described a method of producing an alkali metal sulphide by reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulphide.

6. Each of three claims recited in the complaint is directed to this method of producing sodium sulphide or to a modification thereof.

7. The Commissioner of Patents declared an interference between said Cunningham application and said
18 Lanzetti application to determine priority of invention with respect to the process of producing an alkali metal sulphide by reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulphide, and the Patent Office Board of Appeals awarded priority to Lanzetti.

8. While Cunningham is entitled to a date of conception prior to June 15, 1935, he failed to reduce the process to practice before June 15, 1935, the date of Lanzetti's Italian application.

9. Cunningham was not diligent in reducing his conception to practice and Lanzetti is entitled to priority.

Conclusions of Law

1. Plaintiff's assignor is not entitled to be adjudged the first inventor of the subject matter defined in the claims recited in the complaint.

2. The decision of the Board of Appeals of the Patent Office awarding priority to Lanzetti is correct.

3. The complaint should be dismissed with costs.

JENNINGS BAILEY,
Justice.

19 Endorsed: Filed Dec 9 1941 Charles E. Stewart, Clerk

In the District Court of the United States for the District of Columbia

Civil Action No. 3309

The Mathieson Alkali Works, Inc., *Plaintiff,*
v.
Luigi Achille, *Defendant.*

Final Decree

This action having come on for trial and the same having been considered, it is this 9th day of December, 1941, ordered that the complaint in this case be and the same hereby is dismissed with costs against the plaintiff.

JENNINGS BAILEY,
Justice.

Approved as to form:

....
Attorney for Plaintiff.

20 Endorsed: Filed Jan 8 1942 Charles E. Stewart, Clerk

In the District Court of the United States for the District of Columbia

Civil Action No. 3309

The Mathieson Alkali Works, Inc., *Plaintiff,*
v.
Luigi Achille, *Defendant.*

Supplemental Final Decree

In further consideration of this action, it is this 8th day of January, 1942, ordered that the Cross-Complaint and the Counterclaim in this case be, and the same is hereby dismissed with costs against the plaintiff.

JENNINGS BAILEY,
Justice.

21 Endorsed: Filed Jan 8 1942 Charles E. Stewart, Clerk.

In the District Court of the United States for the District of Columbia

Civil Action No. 3309

THE MATHIESON ALKALI WORKS, INC., *Plaintiff*,

v.

LUIGI ACHILLE, *Defendant*.

Notice of Appeal

Notice is hereby given that The Mathieson Alkali Works, Inc., plaintiff above named, appeals to the United States Court of Appeals for the District of Columbia from the final judgment entered in this action on December 9, 1941.

CLARENCE M. FISHER,
Attorney for The Mathieson Alkali Works, Inc.
834 National Press Building
Washington, D. C.

January 8, 1942

Memorandum

January 8 1942

Cost bond on appeal filed.

23 In the District Court of the United States
for the District of Columbia

Civil Action No. 3309

The Mathieson Alkali Works, Inc., *Plaintiff*,

v.

Luigi Achille, *Defendant*.

Washington, D. C.
Wednesday, May 28, 1941.

The above-entitled cause came on for Trial before Associate Justice Jennings Bailey, in Civil Division No. 6, at 2:15 o'clock p. m.

Appearances:
On Behalf of Plaintiff:
  Clarence M. Fisher
  Raymond F. Adams
  Louis D. Forward
  Pennie, Davis, Marvin & Edmonds

On behalf of Defendant:
  Harry Price
  Henry H. Benjamin

Proceedings

24 Mr. Fisher. I would like permission at this time to associate Mr. Louis D. Forward as attorney on behalf of the plaintiff in this action. He is not a member of this bar, but is a member of the bar of the State of New York.

Mr. Price. I am a member of the District bar.

Mr. Forward. Your Honor, plaintiff is the assignee of the application of George Lewis Cunningham for a patent for a process of producing alkali sulphide. The defendant is the assignee of the application of Enzo Lanzetti which is directed to a patent for the same subject matter. In the

Patent Office an Interference was declared and decision rendered in favor of Lanzetti. The complaint herein requests this court to declare Cunningham to be the first inventor of the invention, the subject matter involved being described in the three claims recited in the complaint on page 4. While it sounds very complicated, it is really a very simple chemical invention. It involves the discovery that an amalgam reacting with an aqueous solution of the corresponding alkali polysulphide will produce the alkali sulfide. The alkali metal treated to produce the alkali sulfide may be sodium, which is the outstanding alkali metal from a commercial standpoint. That is the meat of it. It is just that discovery; that those two things will react together and result in this other product. This was a reaction unknown before, and the claims are directed to a process to this end. Those three claims are substantially the same, the only distinction being that one of the claims gives the percentage of alkali in the amalgam reacting with the aqueous solution of the polysulphide; the other claim says that a sulfide and sulphur, instead of polysulphide, is used in the reaction. That is exactly the same thing, so we will only have the one main thing to consider: who was the first to reduce to practice the process consisting of mixing an alkali amalgam with an alkali polysulphide for the purpose of producing an alkali metal sulfide. That is practically the whole thing.

Now, I would like to point out that the plaintiff's assignor filed his application in this country on February 4, 1936. Lanzetti, the defendant's assignor, filed his application a little over two months later, April 15, 1936. In his preliminary statement that was filed, it was acknowledged that the first time Lanzetti introduced this subject matter in this country was at the time of the filing of his application. Lanzetti claims, however, the benefit of a filing date of an earlier Italian application. The Italian application is asserted to have a filing date of June 15, 1935. Now, plaintiff will show that when Lanzetti did start—the earliest date to which Lanzetti is entitled in this country is his filing date, which was subsequent to Cunningham's filing date, unless he is entitled to his Italian filing date and, if the latter, that still is the earliest date to which he is entitled. Now, plaintiff intends to show that prior even to the Italian filing date of June, 1935, as far back as 1934, in the latter part of July, 1934, Cunningham mixed these two materials together and found this reaction to take place.

Dr. Cunningham was a research chemist in the employ of Mathieson Alkali Company. The Mathieson Alkali Company, as we will show, was engaged in the manufacture of sodium and chlorine on a very large scale by electrolysis, using sodium chloride—ordinary common salt— 26
which was passed as a brine solution through a cell making chlorine and sodium. One of the electrodes in a cell of that type is mercury and the sodium appears as a material dissolved in the mercury, more or less; that is to say it is a sodium amalgam containing the outstanding alkali metal.

They were endeavoring to find new uses for the sodium, to increase the market outlets. Dr. Cunningham was one of the research chemists of Mathieson Alkali Company who was active in trying to learn new uses for this sodium when he discovered this thing in the latter part of July, 1934. At the end of that month a regular research report was sent out to two or three people. That report carried a description of the discovery, stating he had made this test and that the indication was this reaction had occurred, and the following month—still 1934, August—he repeated that. His regular research report and note books, part of the regular records kept by the Mathieson Alkali Company, carry note of it. That experiment was repeated in August, 1934. And again it was reinvestigated in December, and recorded again in his note book and again at the end of December in his research report, circulated to both the New York and Niagara offices. And there was another report where he said, "I have reinvestigated this thing and find it reacts as written."

Along in the spring of 1935 he made some further tests to discover how and the extent to which impurities might be present in the sodium sulfide. I might diverge here to say a word as to the structure of the research bureau. The Mathieson Alkali Company maintains a research and development unit which operates in Niagara Falls; the
27 main office is in New York.
Mr. Gage is in entire charge of research and development. Under him are two branches, one having to do with pure chemical research; the other with development in plant stages. The pure research branch was in charge of the assistant director of research, Mr. Taylor. Mr. Taylor will testify here today. He testified at the Patent Office proceedings. These reports, made in the early part of 1935, and the latter part of 1934, were considered by Mr. Taylor of such importance that he wrote Mr. Gage, describing those findings of Dr. Cunningham that Dr. Cunningham had described to him, and Mr. Gage made a trip to Niagara Falls and discussed those things there. In June, June 11, 1935, Mr. Taylor made his report, which is a few days from and ahead of the Italian filing which Lanzetti is claimed to have made. At this conference in Niagara Falls, at which time Mr. Gage came to discuss this matter along with the other matters, they thought so much of it that Mr. Gage returned to New York and had a market report made to see what were the possibilities of selling that product, and how much they could expect to sell, and make from it if they erected a large plant. Development had gone to that stage before June 15, 1935, which is the earliest date that Lanzetti can be entitled to in any event. At about that time Mr. Cunningham went away on his vacation and when he came back he resumed work.

The Patent Office decided against Cunningham, accepting more or less generally the facts, but we say the difficulty is they erred in the legal conclusion to be drawn from these facts. They acknowledged that these early reports establish conception by Cunningham here in this country

prior to the earliest date possible to be availed of by
28 Lanzetti. Then they felt that, on the question of
diligence, since at the time the Italian application was filed this market report was being drawn up, there was a lack of diligence, and decided against Cunningham both on the ground of failure to reduce to practice, because of alleged failure of his proofs to meet certain legal requirements, and alleged failure to show diligence. They accepted, however, a document which purported to be a certified copy of the Lanzetti Italian application as filed and which clearly, on its face, was not, and I don't believe that even here defendant's counsel will insist it was a copy of the original Italian application; but the Patent Office nevertheless accepted that and gave Lanzetti the benefit of his Italian filing date, and on that ground alone awarded priority to Lanzetti. The proofs we intend to submit here are those that were submitted in the Patent Office largely, and we would like to call Mr. Taylor later to make more precise certain phases of his testimony which have been criticized.

Opening Statement on Behalf of the Defendant by Mr. Harry Price.

Mr. Price. I am in rather an embarrassing position in connection with this case. My clients are in Italy, and it has been extremely difficult for me to communicate with them. I have had great difficulty in getting instructions and getting other things from them. I am, more or less, on my own, and for that reason I will have to do the best I can.

I was associate counsel for the attorneys of record in
the Patent Office, and before the Board of Appeals,
29 both of which tribunals decided in favor of my client,
Enzo Lanzetti, the applicant in the Patent Office proceedings and who is assignor to the real party in interest here.

In addition to that, I have the problem of illness of my wife. I have had to delay this case until Monday, and then until Tuesday. I personally had my office call Judge Kirkpatrick in Philadelphia, where I must be tomorrow morning, so I will have to govern the presentation of my questions accordingly in order to finish today. I think I will be successful because from my consultation with the attorneys for the plaintiff I understand Mr. Taylor will be a short witness and I will have few questions to ask him. I therefore imagine it will be possible to finish this matter today. After all, the facts are not disputed. The same facts will be presented to Your Honor as were presented to the Interference Examiner in the Patent Office and to the Board of Appeals in the Patent Office, which upheld him. This chemistry problem need not bother Your Honor at all. It is a simple question of law, and that question is, How do you corroborate a reduction to practice? There isn't any question as to the conception.

Now, as to dates, whether we are entitled to any date before the Italian filing date of June 15, 1935, is something I will go into at the beginning of my case after Mr. Taylor has testified, but as far as the issue presented here, and passed on by the Patent Office, is concerned, it is: Can an inventor sit down and write out notes in a book and then once a month write a report to his superior and in that manner corroborate the reduction to practice? The Patent Office has repeatedly held to the contrary, as has the Court of Customs and Patent Appeals, and Your Honor is really here being asked to reverse or hold differently from the rulings of that Court, steadfastly maintained in a line of cases.

The Court. I recall one case which I decided in favor of a party. Thereupon, the Court of Customs and Patent Appeals took a contrary view which I followed and the Supreme Court reversed me.

Mr. Price. There is one case in particular I wish to invite Your Honor's attention to, and that is the case of Collins v. Olsen, in which, if you have the names of the parties transposed, that case will present a situation on all fours with this case. Now, in respect to this finding as to dates, I will produce a recent United States Supreme Court decision. In respect to this objection to the Italian certified copy, the objection is this: If this court would certify a record to a Court in Pennsylvania or New York, and if the court stenographer or the clerk of this court would certify, "This is a true original," and had made a copy from the court records that would not, of course, be an original, because it was a copy, and then certify it to a court in New York or Pennsylvania, we think the objection could not be made and sustained that it was not such an original as is required. It is obviously impossible to send an original. What most courts do is they make a copy ond say, "This is a true copy of the original document on file." Because there were some dates on it after the filing date plaintiff objects to it. A copy was made of the original and certified to be a true copy, the certification made at a much later date. That is all I have to say for an opening at this time. I might say this, that a patent has already issued to Lanzetti's assignee.

31 I haven't described the invention. It is a chemical invention but I don't think the substance of the invention is of much importance in this matter. The flow sheet of the patent shows more or less the conversion of this sodium amalgam and sulphur into sodium sulphide; that is all there is to it.

Mr. Forward. I will agree that the Court of Customs and Patent Appeals has held very closely against us, but the Court of Appeals in the District of Columbia and the United States Supreme Court both are in favor of our position.

I would like to offer in evidence first as plaintiff's exhibit A, a stipulation of the parties to the effect that the parties are incorporated and residents as set forth in the complaint, and that the applications are assigned as set forth in the complaint.

(Stipulation as to incorporation was marked Plaintiff's Exhibit A and received in evidence.)

I would like to offer as plaintiff's exhibit B, a certified copy of the Patent Office file and contents, including the original application of George L. Cunningham.

(Copy of Cunningham application file was marked Plaintiff's Exhibit B and received in evidence.)

I would like to offer as plaintiff's exhibit C, a certified copy of original United States application of Enzo Lanzetti.

(Copy of application of Enzo Lanzetti was marked Plaintiff's Exhibit C and received in evidence.)

I would like to offer as plaintiff's exhibit D, a copy of the testimony on behalf of Dr. Cunningham in the Patent Office proceedings.

32 (Copy of Testimony in Patent Office Proceedings was marked Plaintiff's Exhibit D and received in evidence.)

I would like to offer as plaintiff's Exhibit E, the Patent Office exhibits 1 to 27 inclusive. I would like to have those designated as E-1, E-2, and so on, down to E-27.

(Patent Office exhibits Nos. 1 to 27 were marked Plaintiff's Exhibit E, and received in evidence.)

I would like to offer as plaintiff's exhibit F, a certified copy of the Patent Office file and contents exclusive of the briefs in the Interference between the Cunningham application and the Lanzetti application. It continues through from the declaration of the interference to the decision of the Patent Office Board of Appeals dated February 14, 1939.

(Patent Office File and Contents in Interference Proceeding was marked Plaintiff's Exhibit F and received in evidence.)

In view of the fact that in the answer—there has been an answer and counterclaim filed here challenging Taylor's right to give further testimony—I would like to have in the record a stipulation of the parties waiving any such objection.

(Stipulation re Taylor's testimony was marked Plaintiff's Exhibit G and received in evidence.)

The parties have entered into a stipulation, subject to certain objections, as to what Enzo Lanzetti, who is a resident of Italy, would testify to if called as a witness on behalf of the defendant; and I would like to offer as exhibit H the first four pages and the first paragraph at the top of page five of this stipulation. That part, I think, is material. It relates to ultimate facts and not to when things were done. It is my understanding that what was done in Italy is of no significance in the United States other than the actual filing of the application. 33

(Parts of Stipulated Testimony of Enzo Lanzetti marked plaintiff's exhibit H and received in evidence.)

Mr. Price. Don't you think it would be good to have the whole stipulation go in, because there is some dispute about certain of the matters contained therein? Let it go in and you may have your objection to it.

Mr. Forward. No, you may offer what you want. I am offering only the first four pages and the first paragraph of page five. I think that is material and relevant; I don't see that the rest of it is.

The Court. Only offer what you wish and he can offer the rest.

Mr. Forward. I would like to offer as plaintiff's exhibit I the first page and the first three paragraphs of the second page of a stipulation concerning what Mr. Angelo Biancardi would testify to if called as a witness on behalf of the defendant.

(Parts of Stipulated Testimony of Angelo Biancardi marked plaintiff's exhibit I and received in evidence.)

I would like to call Mr. Taylor.

Thereupon

Maurice Craig Taylor was called as a witness for and on behalf of the plaintiff, and, having been first duly sworn, was examined and testified as follows:

Direct Examination

By Mr. Forward:

Q. Will you give your full name? A. Maurice Craig Taylor.

Mr. Forward. I think, your Honor, before proceeding with the testimony of Mr. Taylor, who has already testified in the Patent Office proceedings—his testimony here
34 will be rather sketchy and to understand it a brief
explanation of what has preceded in the Patent Office would be of considerable help. Cunningham was called to testify in his own behalf, and he testified that he had made these various tests in the fall and late summer, late summer of '34, and spring of 1935, with some additional tests later in 1935; and he identified his regular laboratory note books in which he kept records of all his research work and, particularly, certain pages thereof in which notations relative to those matters were made at the time the experiments were carried out. In addition, he testified to various conferences he had with Mr. Taylor and to the effect that he worked with Mr. Taylor, who was his immediate superior. He also identified a number of reports, one of which was made by Mr. Taylor himself, with the collaboration of Mr. Cunningham. Mr. Taylor then acknowledeged this report and signed it, acknowledged the receipt of several other reports at that time, and referred to his various discussions during that period with Mr. Cunningham about the work that was going on under Mr. Taylor's direction. Mr. Taylor was at that time, according to his testimony, the assistant director of research of the Mathieson Alkali Company, and Dr. Cunningham was a research chemist.

By Mr. Forward:

Q. You have testified in this controversy in the Patent Office Interference proceedings, have you not? A. Yes.

Q. Mr. Taylor, what is your technical education? A. I received my technical education at Purdue University in the years 1914 to 1918, obtaining a bachelor of science
35 degree in 1918.

Q. What did you do on completion of your scholastic work? A. On completion of my scholastic work I was inducted into the army and assigned to Edgewood Arsenal. In this work I was further assigned to the civilian service at Ohio State University where I worked under the officers of the chemical warfare service, in the chemical warfare service. I remained until the summer of 1918, when I was transferred to the laboratory of the Edgewood Arsenal which had just been completed. I continued the work in the chemical warfare service at this place until the end of the war. My work was concerned with the determination of the physical chemical properties of the various poisonous gases.

Q. When did you leave the army? A. I left the army in December, 1918, at which time I was dischargd from the army, and applied for a position as research chemist with the Mathieson Alkali Company. I went to work for them in January, 1919, as research chemist, and continued to work in that capacity at research chemical work until about 1923 or 1924, when my work was changed to chief research chemist. I continued in this capacity until about 1930 or 1931, at which time I was made assistant director of research and continued at this work until about a year ago, when I was made manager of research. During all this time I was engaged in the chemical research work and the supervision thereof, which had as one of its objects the improvement in processes used by, and development of new products for the company.

36 Q. During your service with Mathieson Alkali Company have you made it a point to keep in touch with

the development in the field of chemistry, and in the chemistry of alkalies in the industry generally, other than in the Mathieson Alkali Company. A. Yes, I have, I would say that one of my main duties was to keep familiar with the progress of industrial development in all fields that are related with ours, both from a scientific angle and a commercial angle, and as to the activities of any of our competitors.

Q. Mr. Taylor, Mr. Cunningham has identified two note books, red bound note books, in the Patent Office Interference proceeding, which I have just handed to you. I would like to ask you if you recognize these books? A. Yes, I do.

Q. Have you ever seen them in the possession of Dr. Cunningham during the year 1934 and the first six months of the year 1935; the first five months of 1935? A. Yes.

Q. And at the laboratory of the Mathieson Alkali Company? A. That is right.

Q. Whose property are these books? A. These books are the property of the Mathieson Alkali Company.

Q. Is Dr. Cunningham now in the employ of the Mathieson Alkali Company? A. No, sir; he is not.

Q. When did his employment with that company cease? A. About a year ago.

37 Q. If yourself or any of your staff at the present time have any occasion to refer to the work, research work done by Dr. Cunningham while he was in the employ of the company, what are your sources of information? A. Our sources of information would be these laboratory books; these red laboratory books were used by all the men and by Dr. Cunningham when he was with us.

Mr. Price. I think this is a little suppositious testimony. It is a question of what would happen if they had occasion to look something up.

The Court. Did you ever look them up; those matters in those books? A. Yes; that is what we keep them for; that is their purpose; to look at them and check up.

By Mr. Forward:

Q. Now, one of the books is identified as note book 15, and the other is identified as note book 16. I would like to have you look at page 43 of note book 15, which is plaintiff's exhibit E-1, and at page 69 of that book, which is plaintiff's exhibit E-3; at page 71 of that book, which is plaintiff's exhibit E-4; and at page 26 of note book 16, which is plaintiff's exhibit E-5; and at page 73 of note book 16, which is plaintiff's exhibit E-7; and then at pages 91, 93, 95, and 96, of book 16, which collectively are plaintiff's exhibit E-8. A. I have done so.

Q. Mr. Taylor, I would like to know whether or not the experiments described in these notes to which I have just referred were discussed by you with Mr. Cunningham prior to June 11, 1935, which is the date upon which you signed the report which is plaintiff's exhibit E-10. A. Yes,
38 I did.

Q. I also want to refer to plaintiff's exhibit E-8, page 91 of book 16.

Mr. Taylor, I would like to have you describe in lay language the experimental procedure purported to be described on that page. A. This page gives in the first line the chemical reaction which it was desired to carry out. In this reaction Na stands for sodium and—

The Court. I think I know those.

A. The reaction shows sodium polysulfide plus two atoms of sodium dissolved in the mercury, (Hg) means that the sodium was dissolved in mercury, produces two molecules of sodium sulphide.

The next line of this record: 500 cubic centimeters of aqueous solution containing one half mol of sodium sulfide was boiled until one half mol of sulphur dissolved.

Q. What would that reaction produce? A. That reaction would produce sodium polysulfide which is expressed in the equation at the start as sodium polysulfide.

The next following line says that 8 grams of sodium were put into 8,000 grams of mercury. Sodium dissolves in the mercury, making a liquid.

Q. And what does that produce? A. And that produces what we call sodium amalgam. This solution, at 60 degrees centigrade, was added to the amalgam with an agitator present in the amalgam, and running. The
39 temperature rose to 80 degrees centigrade. The
record further states that when the amalgam was discharged, which was in about fifteen minutes, there was mercury sulfide present in the liquid. Now, this mercury sulfide, when it appears, causes the amalgam to lose its luster. It becomes dull in appearance, and then if the solution is diluted or acid added to it, a heavy black suspension of mercury sulfide forms. Because of this change I am explaining it is easy to see that the mercury sulfide has been formed in the liquid.

Q. Will you please explain what is meant by "the amalgam is discharged"? A. By that it meant that the sodium that had been put in the amalgam has all reacted with the polysulfide with which it is in contact.

Q. Just leaving the mercury? A. Yes. The next line of the record says that 8 grams of sodium were put in the mercury and again the solution was added to it. The amalgam was again discharged in about fifteen minutes. A small amount of mercury sulfide was then again present in the solution, and again 8 grams of sodium were put in the mercury and added to the solution. At this point the mercury was practically discharged of its sodium in fifteen minutes, and there was no mercury sulfide in the solution.

By "practically discharged" is meant that a little sodium was left in the mercury.

The rest of the record on this page, and the following page, 93, gives figures to tell us how the sodium polysulfide had reacted with the sodium to give sodium sulfide. I can explain that further if you wish.

40 Q. Will you explain the nature, just the general nature, of the method of analysis as indicated there?

A. At the top of page 93, the second line, there is the figure 49.71, and following, the same line, the symbol I. That is the result of the titration of a sample of mixture of the liquor with a standard iodine solution. If sodium sulfide was the only material in that solution that titration would constitute an analysis for it, but since there is a possibility of sodium hydroxide or sodium sulfite or thiosulfate also being present, it is necessary to make a more careful and complete analysis, so that a titration of total sodium in the solution was made as shown on the bottom of page 91, in which the figure 10.81 cc's is given, followed, in the same line, by the symbol HCl, meaning hydrochloric acid. That gives the total sodium, and taking those two figures together it is posible to calculate how much of both sodium hydroxide and sodium sulfide are present. Now, in order to get some idea of the sulfite and thiosulfate that may be present, further titrations may be necessary, and are given on page 93.

These figures all taken together and calculated show that the mols of material formed in this solution are substantially as this record shows on page 93, and that substantially 87 percent of the sulphur which had been added at the beginning of the experiment had been converted to sodium sulfide.

The following two pages of exhibit E-8 are all more or less the same type of experiment. These two pages are the record of a repetition of the experiments I have described except that the flask was kept at 40 degrees centigrade instead of 60 degrees centigrade.

41 Q. What effect did that have on the yield of the amount of sulfide? A. The effect of this was to give a still higher yield, approximately 97 percent, as shown on page 96 of the report, 97 percent of the sulpur being converted to sulfide.

The Court. Now, how long will this take?

Mr. Forward. I don't think it will be a great deal longer. That is the last of these particular books I am going to refer to; I just took that as an example.

By Mr. Forward:

Q. I want you to look, Mr. Taylor, at page—

The Court. I was going to suggest if it will take any particular length of time that you might take this witness' deposition.

Mr. Forward. I would very much like to have this cleared up now. It certainly won't be very much longer. I am only going to ask him one or two questions more and then interrogate him very briefly concerning some testimony given at the Patent Office proceeding.

The Court. Well, go ahead.

By Mr. Forward:

Q. Plaintiff's exhibit D, at page 36. The report to which you refer is plaintiff's E-10. A. The question 23.

Q. 23? A. Yes.

Q. Now, in your answer to question 23, you stated that you were familiar with the work Cunningham had been carrying on prior to the date that report was made, exhibit
10, and that you were convinced that his process
42 worked the way he had described it. I wish you would
amplify as much as you can just what your conviction
was based on; just what in particular convinced you. A. My conviction was based on conferences and discussions which I had with Dr. Cunningham. It is my particular business to keep in touch with what all the men in the laboratory are doing from day to day and sometimes from hour to hour, and I do this by going about in the laboratory and talking to the men at their work or having them come to the office and talk with me; and I did this in connection with Dr. Cunningham's work at this time, before June 15, 1935. In doing this I talked with Dr. Cunningham. I saw his equipment and saw his note book; saw his method of analysis and calculation therefrom, and satisfied myself that he was doing what he alleged to be doing; and I particularly was impressed with his statement about the formation of mercury sulfide. I thought that had there been any doubt as to

whether or not he was working on that subject and doing what he said he was doing, that doubt would have been dispelled by this account which he gave to me as to the formation of mercury sulfide at the end of each of these runs which I just described. That would not have been possible to have predicted unless somebody had actually carried that experiment out.

Q. And did you make any attempt to check his method of analysis and see whether it was a standard method, and see whether his calculations led you to the same conclusion as it did him, with respect to what his data showed? A. Yes, I did. He used methods which were standard, given in
43 a book by Griffin, and there was no question as to the analytical part of his work.

Q. In these conferences, from time to time, was there any discussion by you as to what tests were, or should be, made? A. Well, there was. That was one of the important purposes of these conferences — to determine what should be done in that respect.

Q. Now, you are familiar with the market report that was made during the summer of 1935, in connection with the possibilities — the marketing possibilities — of sodium sulfide, are you not? A. Yes.

Q. At the time of this report, plaintiff's exhibit E-10, at the time it was sent by you to Mr. Gage, was there any instructions by you or through you to Dr. Cunningham to cease or suspend, even temporarily, his further work in connection with this process pending completion of this marketing report? A. No, sir, there were no such instructions given by me to him directly or through me from Mr. Gage to stop this work. In fact, I was very anxious that he proceed as was indicated in my June 11th report.

Q. Did you discuss the matter of any experiments to be made in connection with these concentrations in some of the conferences with Mr. Cunningham prior to June, 1935? A. Yes, this question was discussed in connection with cost figures that were in the June 11th report. It is a matter of economics, and if concentrated solutions of sodium sulfide could be thus made, the process would be cheapened, and it was planned to carry on further work during the summer of 1935 on this question of concentration.

44 Q. I wish you would look at plaintiff's Exhibit E-12.

The Court. I will have to stop at three-thirty.

Mr. Price. Here is the situation I am in, your Honor. I have to be—

The Court. I suggested you take this gentleman's deposition, if you want it. I usually adjourn at three-fifteen. I must adjourn at three-thirty.

Mr. Price. Could I suggest this: as far as my cross-examination of this witness goes, could I do that by deposition?

The Court. The Court would not object to that.

Mr. Forward. I would like to have this taken care of before we adjourn. We have been put off time and time again. It is most important that we get this case through.

The Court. Well, I am going to adjourn at three-thirty. Now you can make any arrangement you wish with that in view.

Mr. Price. I was to be up in Judge Kirkpatrick's Court tomorrow morning. Maybe your Honor, if I pay the long-distance telephone charge, would explain the situation to Judge Kirkpatrick.

The Court. I won't do that. You can take this gentleman's deposition. I don't know why you can't take this by oral deposition.

Mr. Price. In view of the shortness of time, I will arrange at any time to meet with counsel for plaintiff, Saturday, Sunday, or any time, and arrange for the cross-examination of this witness. As far as my exhibits are
45 concerned, I could probably handle them during the
course of the cross-examination and all the objections could be made at the time of the cross-examination, and therefore be available at the time of filing the brief.

The Court. I don't care to hear any argument. The case will have to resume at ten o'clock tomorrow morning.

Mr. Forward. I should like to go right on until the matter is concluded.

Mr. Price. It is impossible for me to be here tomorrow morning.

The Court. This case is to proceed here tomorrow morning and I see no reason why it shouldn't.

Mr. Price. If I put in a long-distance call at my expense, could I have you talk with Judge Kirkpatrick, your Honor?

The Court. No. The case will be resumed at ten o'clock tomorrow morning and I expect it to be concluded.

Mr. Forward. We have been put off time and time again.

Mr. Price. Well, then, I will have to go back to New York tonight; I can fly back. I have to see my wife who is ill in a hospital.

The Court. As far as that is concerned, if you have to be with your wife who is ill, that, I assume, would take precedence.

Mr. Price. As far as Judge Kirkpatrick is concerned, I have had to put off a hearing several times. My wife has been ill and approaching illness for some time. It would help me if I could have the Court Commissioner, the Assignment Commissioner, take the matter up by telephone at my expense with Judge Kirkpatrick. Would your Honor have any objection to that?

The Court. That is all right, if you get the Assignment Commissioner to do that, but I insist that this go on
46 tomorrow morning at ten o'clock.

(Thereupon, at 3:20 o'clock p. m., the trial was adjourned until 10 o'clock a. m. tomorrow, Thursday, May 29, 1941).

48 In the District Court of the United States
for the District of Columbia

Civil Action No. 3309

THE MATHIESON ALKALI WORKS, INC., *Plaintiff*,

v.

LUIGI ACHILLE, *Defendant*.

Washington, D. C.
Thursday, May 29, 1941.

The trial of the above-entitled cause was resumed before Associate Justice Jennings Bailey in Civil Division No. 6, at 10 o'clock a. m., pursuant to adjournment on yesterday.

Appearances:

On behalf of the Plaintiff:
Clarence M. Fisher
Raymond F. Adams
Louis D. Forward
Pennie, Davis, Marvin & Edmonds.
On behalf of the defendant:
Harry Price
Henry H. Benjamin.

49 *Proceedings*

Thereupon **Maurice Craig Taylor** was recalled as a witness for and on behalf of the plaintiff and, having been previously duly sworn, was examined and testified as follows:

Further direct examination
By Mr. Forward:

Q. Mr. Taylor, just at the close of yesterday's proceedings I was directing your attention to the letter which forms Plaintiff's Exhibit E-12. In that letter there is included as part of a sentence a statement to the effect that

"I am a little vague on just exactly what has been done," and then proceeds. I wish you would state as near as you now can just what that vagueness refers to; whether or not it applies to the tests you discussed yesterday or to other tests and, if so, which tests. A. This vagueness refers to the work of Dr. Cunningham just one week or so prior to the writing of this letter on August 17th. We had planned to do some experimental work, particularly on concentrations that could be obtained in the process, and Dr. Cunningham going away on his vacation, I had been unable to arrange a conference with him to find out just what his work in the few days just previous to his leaving consisted of, and that is what I referred to as being vague.

Q. Mr. Taylor, when a chemist refers to a solution of a salt, without specifying the solvent, is there any general understanding as to what solvent is meant? A. Yes, it is generally understood that a solution in water is meant. If a solution in some other medium is meant that medium is particularly mentioned.

Q. In some of these reports there appear to be a number of different designations to represent the material, sodium polysulphide. Will you say generally what different designations are customarily used to designate sodium polysulphide? A. The prefix of "poly" means more than one, so that polysulphide may be expressed by formulas showing two or three or four atoms of sulphide. They all mean polysulphide.

Q. Is the designation Na_2S_x ever used to designate polysulphide? A. Yes it is, because the compound is not as definitely characterized as are some others, and the x means that it may be one of several designations.

Q. But always more than one? A. Yes, always more than one.

The Court. Do they not sometimes use n instead of x?

A. Yes, although that is a little more significant; it has a little more significance.

By Mr. Forward:

Q. Read the question starting at the bottom of page 19 of the transcript of yesterday, your answer being on page 20. Will you read that question, and your answer? A. Yes.

Q. Having read it, would you care to change it, amplify it, or in any wise alter it? A. Yes, in two respects. When I mentioned that a formation of mercury sulphide at the end of each run I should have said at the end of each intermediate stage of the run there described. The
51 phenomenal thing was that the mercury sulfide having been formed, it was used up by the additional quantities of sodium, and that when we had enough sodium in the batch to completely use all the sulfide then the mercury sulfide no longer appeared, so that in the final stage of this experiment there was no mercury sulfide.

And in the second respect, while I was in Dr. Cunningham's laboratory, and observed the note books and his equipment, and what he was working at, yet so much time has elapsed since this work was being done that I do not wish to convey the impression that I ever saw the actual carrying out by him of a complete experiment. I don't remember having seen him do this, although I may have seen him.

Q. Mr. Taylor, this sodium sulfide as made by this process of Dr. Cunningham's was considerably better grade than the sodium sulfide of commerce as of that date? A. Yes.

Q. It was possible prior thereto, however, to obtain high purity sodium sulfide for laboratory purposes if you were willing to pay the price for it, though, wasn't it? A. Yes.

Q. In Exhibit E-21, starting under the heading "Run No. 1367" on page 2, and concluding just above the heading "Run No. 1368" on page 3: Can you state whether that is a description of the same subject-matter described in E-8 on pages 1 and 2? A. Yes, that is the same subject-matter.

Q. Will you again refer to Plaintiff's Exhibit E-8 and in particular to the bottom of the second page. In your testi-

mony yesterday I believe you stated that the data in
52 in this exhibits showed the percentage conversion of
sulphur into sodium sulfide to be 87 and a fraction per cent. I notice in the last line the statement "82.17 per cent to Na_2S". Is there any inconsistency between those two statements and, if so, please explain it? A. The statement in the first of these lines says "percent sulphur to sulfide ion": He has here the letter "S" with two dashes above it, which is the usual designation for divalent ion. The second line says "Percent sulphur to sodium sulfide": Chemically, there is no difference in the meaning of those two statements.

Now, the fact that he has different figures there means that there are various ways of interpreting and calculating what those percentages conversion are, and while I am not sure what methods Dr. Cunningham used in getting those two figures, I have gone back to his original titrations, which are the important part of these red notebook records, and calculated from those original titrations what this percentage conversion would be according to my methods of calculation, and I come out with a result that is very close to the 87 per cent.

Q. One more question. The stipulation of Dr. Biancardi was offered in evidence. In the document offered in evidence as Plaintiff's exhibit "I" yesterday I note that on the second page, in the second paragraph of that, it says that Lanzetti "executed iodometrical and acidimetrical measures in order to determine with accuracy the amount of sodium sulfide and impurities". Is that iodometrical and acidimetrical method of determination the same as that used by
Dr. Cunningham in his report? Is that the same gen-
53 eral method of analysis? A. It would appear to be.

Q. That is they used the iodine titration and the hydrochloric acid titration? A. The iodine gives the measure of the sulfide and the acid gives the measure of the total Na_2O (the total output on it) and the two together enable one to calculate how much there is of each.

(Thereupon there was a short informal recess at the conclusion of which the following proceedings were resumed:)

Mr. Price. I thought I might inform your Honor they put that case on trial in Philadelphia anyway, so I am now on trial in both cities.

I haven't had an opportunity of looking through the exhibits but I would like to reserve my objection to them until the close of Mr. Taylor's testimony.

Cross-examination

By Mr. Price:

Q. Now, I believe, on your direct-examination yesterday you testified to the effect that the formation of mercury sulfide was something that was quite unexpected. Is that a correct restatement of your testimony? A. I would say it was uncertain whether it would form.

Q. And would it be a correct restatement of your testimony that it was uncertain that mercury sulfide would form under the conditions of experiment carried out or alleged to be carried out by Dr. Cunningham when he combined sodium amalgam with sodium polysulfide? A. Yes.

54 Q. Now, you recall, do you not, your early experiments with chemistry, even before you attended Purdue University, and probably in your high school training; and do you recall that the first experiment you carried out in the first or second year of your high school career concerned the treatment of various metals, such as copper, iron, etc., with sulphur to form sulfides? A. Yes.

Q. And don't you recall that the earliest principles taught to chemistry students, such as you, involved an experiment showing the activity of sulphur, its avidity in combining with various metals to form sulfides? Is that correct? A. It is a pretty general statement. I don't think I would want to vouch for it in all cases.

Q. But sulphur is a very active element and tends to combine energetically and readily with metals as a general rule? A. I think I would not understand the question unless you made it more specific.

Q. Whether or not sulphur is active, it does tend to combine readily with metals, isn't that correct? A. It depends on conditions.

Q. Well, assuming that the same conditions are maintained in your mind as were maintained in the laboratory in the second or first year of high school: Under these conditions would sulphur tend readily to combine with metals? A. I haven't any idea.

Q. You would hesitate to guess whether sulphur would combine with metals under those conditions? A. You haven't defined the conditions.

Q. Well, I have defined the conditions to be exactly
55 the same as they existed in the laboratory when you
conducted your first experiment in making sulphide
in high school before you went to Purdue. A. That was so long ago I haven't the slightest recollection of those conditions.

Q. Your memory is much better as to '35 and '34, is it? A. Yes, that is true.

Q. All right, during the period 1934 and 1935, how many persons were employed by the Mathieson Alkali Works in their research laboratory? A. I don't know the exact number, but it would be from ten to twenty.

Q. And were they research chemists? A. Some of them.

Q. About how many were research chemists? A. Oh, possibly ten.

Q. And did they all keep note-books, such as these red note-books as included in Exhibit E-1, 3 and 4, and E-16 and 18? A. Yes.

Q. And you had constant charge over those note-books? A. The men had charge over their books while they were working with them, and when they finished with the book they would turn it in to me.

Q. Where was your office located with respect to the laboratory in which these note-books were kept? A. My office is in the laboratory where the note-books are used and where the work was being done. In order for safekeeping we took the books to the company office for filing so that they wouldn't be burned up in case of fire.

56 Q. This laboratory is at Buffalo, New York? A. Niagara Falls.

Q. How many floors are there in that building? A. Four floors, counting the basement.

Q. And on what floor did Dr. Cunningham work? A. He worked on the second floor; he worked on the third floor, starting at the basement to count.

Q. Where is your office? A. My office was on the second floor, by the same reckoning. I am afraid we may be a little confused, but the Court I think will understand what I mean.

Q. And there also were laboratories on the second, third and fourth floors? A. There were laboratories on the second and third floors.

Q. Is every sodium sulphide that contains a greater proportion of sulphur to sodium than is represented by the formula Na_2S, sodium polysulfides? A. I am sorry: Will you state that question again?

Q. I will withdraw the question. Are all sodium sulphides which contain more sulphur in proportion to sodium than indicated by the formula Na_2S, sodium polysulphides? A. Your question is contradictory in itself. You call it sodium sulphide at the beginning and you call it sodium polysulphide at the end.

Q. Is sodium polysulphide a sodium sulphide or not? A. No, sir. I wouldn't say so. I don't know but one sodium sulphide.

Q. Is sodium polysulphide also generally or generi-
57 cally known as a sodium sulphide? A. Not accord-
ing to our way of naming them.

Q. Now, in connection with the production of mercury sulphide from sodium amalgam and sulphur, what mercury is formed, a mercuric or a mercurous sulphide? A. I would expect it to be mercurous sulphide.

Q. The formula which is written in these various notebooks is H_gS? A. Yes.

Q. That is mercuric sulphide? A. Yes.

Q. So, therefore, your expectation as to the type of mercury sulphide that was formed is not correct, nor proven by the experiment. Is that a correct statement? A. We didn't attempt to identify the mercury in the sulphide, and I don't know which it was.

Q. And Dr. Cunningham's notes may have erred in that respect? A. That is possible.

Q. Did Dr. Cunningham ever state to you that it was as much a surprise to him as it was to you to find that mercury sulphide, either mercuric or mercurous, was formed? A. His attitude, as I remember, was that he didn't know whether it would be formed, and he was carrying out his experiment and observed the conditions under which it was formed, namely, when the sodium was depleted from the amalgam then the sulphide was formed, and when the sodium is not depleted sulphide does not form. He observed that in his experiments.

Q. But you didn't answer the question. Will you
58 reread the question?

(Thereupon the pending question was repeated.)

Mr. Forward. May I call your Honor's attention to the fact that Mr. Taylor this morning in his amplification on that very point indicated that it formed and disappeared—not just that it formed. Now, this question is framed on the basis of an occurrence of the condition as originally stated and as not subject to the correction, and, therefore, is not in accordance with his present testimony.

By Mr. Price:

Q. Now, in respect to what possibly could happen with sodium amalgam when combined with sodium polysulphide, it is correct that a chemist might predict that any one of the following compounds might be formed: sodium sulphide;

sodium sulphite; sodium thiosulphate; sodium hydroxide; mercuric sulphide; mercurous sulphide. A. Yes.

Q. Now, refer to Exhibit E-1, which is notebook No. 15, page 43: In that particular page of the notebook there isn't any calculation, is there, of the amount of sodium sulphide that was formed? A. I haven't had that book yet.

(Thereupon the witness examined the exhibit.)

A. No, sir, there is not.

Q. Nor is there any calculation of how much sodium amalgam was combined with how much sodium polysulphide? A. No, sir.

Q. Now, referring to Exhibit H which includes the stiplated testimony of Enzo Lanzetti, page 1, lines 16 and
59 17, it speaks of testing sodium sulphide in connection
with sulphur dyeing of textile material. Is that a common use of sodium sulphide? A. Yes, I believe it is.

Q. And is that one of the fields in which the Mathieson Alkali Works, your employer, sells sodium sulphide? A. No, sir.

Q. And if you had manufactured sodium sulphide according—if I may term it—to the Cunningham process, would you have sold a large quantity of that sodium sulphide for sulphur dyeing?

Mr. Forward. This is entirely immaterial.

Mr. Price. I will connect it up in a few moments.

Mr. Forward. So that the record may be clear, do you refer when you say "you" to the plaintiff company or Mr. Taylor personally?

Mr. Price. The reference is to the company.

Mr. Forward. Then I object to that. This man has no authority to speak for the company; he is not an officer of it.

The Court. Sustained.

Q. If the material produced as a result of the procedure of Cunningham set forth in the counts of the interference produced the material which could be used in lieu of sodium sulphide for sulphur dyeing, would that be an indication that sodium sulphide had been produced? A. I don't believe it would, necessarily.

Q. If sodium sulphide produced—according to the process set forth in the Cunningham application—if that could be used in sulphur dyeing in lieu of sodium sulphide
60 produced in other ways, would this indicate that this
Cunningham procedure was producing the same sodium sulphide as had been produced by other methods? A. I don't believe that it would.

Q. Now, looking at page 2 of the stipulated testimony of Enzo Lanzetti, Exhibit H, on lines 7 to 10, there are stated:

1. He observed a sensible heat of the mass;

2. He observed a progressive decoloration of the polysulphide solution;

3. He observed the absence of hydrogen production when he combined amalgam with this solution of sodium polysulphide.

Would that all indicate a reaction was taking place producing sodium sulphide? A. Yes.

Q. And coming down to lines 16 and 17 of page 2 of the Lanzetti stipulation, it is stated: "I notice by acidimetry the absence of sodium." Would that also indicate the absence of sodium sulphide? A. That is, when he examined the mercury by means of acidimetry he obtained no sodium? If that is the question, I would say it indicated such action.

The Court. That means what?

A. It means that he takes a sample of the amalgam out and puts it in a flask and adds excess acid to it until the sodium in the amalgam is all reacted with the acid, and then in the presence of an indicator he tirates the excess acid, and that is the measure of the sodium in the amalgam. The process is called a process of acidimetry.

The Court. What is the meaning of the word
61 "acidimetry" in that connection? A. It refers to a
type of analytical procedure in which standard acid solutions are used to measure the amount of alkali.

By Mr. Price:

Q. Now, in line 27, on that same page, you will note the word "chlorhydric" acid. Is Lanzetti there referring to hydrochloric acid? A. Well——

Mr. Forward. Your Honor, I object to that. He could not know what Mr. Lanzetti is referring to. It is a proper question to ask whether hydrochloric acid is another name for it, or is used generally for it.

Mr. Price. I will amend my question. In respect to the term "chlorhydric" used on page 2, line 27, Exhibit H, is that a term which is used to designate hydrochloric acid and has some way been corrupted by a literal translation from the Italian? A. That would appear to be the case.

Q. Now, on page 3, lines 21 to 25, there is a reference to "placing in a stop cock funnel sodium polysulphide solution with a certain amount of amalgam," whereupon the mercury is separated and new quantities of amalgam are added with the constant stirring of the solution. Would that produce sodium sulphide? A. I would expect it would.

Q. And on line 29 of that same page there is again a reference to chlorhydric acid, which should be correctly termed hydrochloric acid, is that correct?

Mr. Forward. I don't think that is a proper question to ask this witness. I will stipulate that wher- 62 ever this stipulation refers to chlorhydric acid, hydrochloric acid is meant, but this witness is being asked what was intended here. I don't think it is a proper question. As I have said, I will agree that wherever that word appears it undoubtedly refers to and means hydrochloric acid.

Mr. Price. Then it is so understood. It is stipulated that on page 3, line 29; page 4, lines 13, 21, 27 and 32; page 6, lines 15 and 16, that chlorhydric acid may read hydrochloric acid.

Mr. Forward. I object to that insofar as it refers to page 6. That is a part of the exhibit not in evidence. It is stipulated, however, that in that part of the exhibit which has been introduced that where it is referred to as chlorhydric acid it should be hydrochloric acid.

By Mr. Price:

Q. Now, on page 6, lines 3 to 16 of Exhibit H, would the process there set forth result in the production of sodium sulphide? A. I haven't these lines numbered, and I am guessing at what you refer to, but if it is the paragraph starting "I put a certain quantity"——

Q. It is those first two full paragraphs. A. Would you repeat the question, now that I have read this?

(Thereupon the pending question was repeated.)

A. Yes, I believe it would.

Q. Now, referring to Exhibit I, page 2, lines 3 and 4, there is a reference to sodium polysulphide, and
63 again that reference occurs on lines 5 and 6 on page
2. Is the word "polysulphide" there spelled with an "i" the same as sodium polysulphide spelled with a "y"? A. Yes.

The Court. You mean are they the same although the spelling is different?

Mr. Forward. I won't question that. Undoubtedly it is the same thing.

Mr. Price. This is chemical nomenclature and I am anxious to avoid any possibility of question. It is stipulated and agreed by and between counsel that polisulphide as spelled with an "i" in lines 3 and 4, and 5 and 6 on page 2 of Exhibit I is the same as in polysulphide spelled with a "y."

By Mr. Price:

Q. Now, on lines 11 and 12—here (indicating)—of this same Exhibit I, there is a reference to "impurities." What are the impurities that are formed? A. You are asking me for an interpretation of another man's affidavit. I don't know what he expected, but in our work we were looking for sulphite and thiosulphate.

Q. In lines 15 and 16 it is stated that the same solutions were crystallized by cooling. Of what concentration would sodium sulphide concentrate have to be before they would crystallize on cooling?

Mr. Forward. I object to the form of the question; the latter part of it is a perfectly correct question and proper, but this other part refers to something that has no reference to sodium sulphide; it refers to cooling but not sodium sulphide.

64 Mr. Price. Here it is, Mr. Forward. It is the next question where it refers to crystallizing?.

The Court. Now what was the question?

By Mr. Price:

Q. Now my question is what concentration does it have to be before this crystallizing by cooling takes place?

Mr. Forward. If you want to ask about a solution containing only sodium sulphide, there is no objection.

The Court. Are you taking the position that that refers to a sodium sulphide solution?

Mr. Price. That was my question. What concentration of sodium sulphide is required before it will crystallize on cooling.

The Court. He is an expert here, and I think he can answer.

Mr. Forward. That question "What concentration of sodium sulphide," so restricted, is different from what I understood it to be before.

The Court. Very well. Answer that.

A. I can't answer that offhand. I don't attempt to remember that sort of information.

Q. Will a solution of 60 per cent of sodium sulphide crystallize on cooling? A. I believe it would.

Q. Will a solution of 32 per cent crystallize upon cooling? A. I don't know.

Q. Are the crystals of sodium sulphide of definite shape and character? A. I believe that question is not an-

65 swerable, as stated. There are various kinds of sodium sulphide crystals. Which kind are you referring to?

Q. What kind of sodium sulphide crystals will you get by crystallizing 60 per cent sodium sulphide solution? A. I don't know just this minute.

Q. Well, assuming that you can get 3, 4, or 5 different hydrates upon crystallization, will all these hydrates have a distinct crystalline form, so that they can be recognized by chemists? A. Of course you can't get five or six hydrates from the same solution all at once. I don't think you meant that in your question. If your question is, would any particular crystal be a definite form, the answer is "yes".

Q. And a chemist could recognize the crystal as sodium sulphide if experienced in inorganic chemistry? A. And if he had the proper equipment to do it with.

Q. And in notebook No. 15, Cunningham's Exhibit No. E-1, page 43, sodium sulphide was not crystallized, according to that experiment, was it? A. It wouldn't appear to have been.

Q. Have you ever seen sodium polytelluride? A. I don't believe I have.

Q. Have you ever seen sodium polyselenide? A. I don't remember seeing it.

Q. Have you ever seen sodium selenide? A. I don't think so.

Q. Do you remember seeing sodium telluride? A. No.

66 Q. I ask you to turn to Exhibit 20 in that book. Did that document ever come to your attention? A. Yes, I have seen that.

Q. And did you approve of that document after reading through? A. What do you mean by "approve"?

Q. Was that document submitted to you for your approval? A. I considered it to be an adequate presentation of the invention for the purpose of patent application.

Q. Now looking at Exhibit E-20, lines 1 and 2, "This invention relates to the manufacture of alkali metal sulphide and selenide and telluride'': At the time you approved this memorandum you had never seen sodium selenide, nor had you seen sodium telluride. Is that a correct statement?

Mr. Forward. I object to that. The man hadn't said that he had not seen them; he said he couldn't definitely remember that he had.

The Court. I think he can testify whether he had seen them.

A. I don't remember that I had seen them.

By Mr. Price:

Q. At the beginning of the next paragraph it says ''The alkali metal sulphide, selenide and telluride are valuable intermediates employed in the manufacture of certain dye stuffs.'' Is that a correct statement? A. I couldn't say. It was Dr. Cunningham's statement, and I don't know what they used in dyeing; they may use it.

Q. And that is true of the rest of Dr. Cunningham's statements: Your recollection as to the truth or falsity of Dr. Cunningham's statement? A. As to that, yes. 67

Q. Coming down to near the bottom of the page, the last sentence on the next to the last paragraph of E-20. It states there, ''The alkali metal amalgam can be prepared in an electrolytic cell such as Castner's or Krebs' cells.'' Are you familiar with those cells? A. I am familiar with the Castner cell in particular. I know something of the Krebs cell.

Q. Were these the cells used by Dr. Cunningham to prepare his sodium amalgam? A. No, they are commercial cells; he was operating in a laboratory.

Q. In the Mathieson Alkali Works they have cells which commercially produce sodium amalgam, is that a correct statement? A. That is correct.

Q. And that mercury amalgam produced in those cells is available in Buffalo right close to the laboratory? A. You mean sodium amalgam?

Q. Sodium amalgam. A. What do you mean by "available"? I can't answer that question until you define the word "available."

Q. Is their laboratory close to the plant of the Mathieson Alkali Works? A. The plant is in Niagara Falls, not in Buffalo.

Q. And where is the laboratory? A. It is rather close to the plant.

68 Q. How many miles away? A. About one and a quarter miles.

Q. And in the plant do they make or manufacture or produce by any other procedure sodium amalgam? A. Yes, as a very temporary intermediate.

Q. How many tons a day of sodium amalgam are produced as a temporary material?

Mr. Forward. I object. If the production was large enough it might be a proper question.

By Mr. Price:

Q. It would be sufficient if you would answer my question by saying they do produce large amounts. A. I can say they do; that large amounts are produced.

Q. Now Dr. Cunningham didn't use any of the large amounts which were produced but he made sodium amalgam independently? A. That is correct.

Q. Why did he not use that which was available at your place? A. Because the amalgam is not available for his purposes.

Q. Are you familiar with the construction of the Castner or Krebs cells so that you could identify a drawing of them? A. Yes, I could, with respect to the Castner cell. I am not as familiar with the Krebs cell.

Q. I hand you here two reproductions containing figures 1 to 4, and ask you to identify the cells on those sheets with which you are familiar. A. Just at a glance I would say I was not familiar with any of these cells, if these
69 drawings are actually drafts of these cells.

The Court. What do you mean by cell?

Mr. Price. The cell is the electrolytic apparatus in which this amalgam is produced. This sodium amalgam is a liquid material which is kept flowing or moving through the cell, and the sodium chloride splits up into sodium and chlorine ions and the sodium ions removed electrically and dissolve in the mercury, whereas the chlorine comes off on the other side. I think in the drawing of the Lanzetti patent a typical cell is indicated as No. 1, an electrolytic cell. This is in much more detail showing the construction of the electrolytic cell.

Q. Turning now to Exhibit 20, page 2 thereof, at the top of this page there is reference to certain difficulties which are encountered, including, for example, the exclusion of air and oxygen and the production of sulfite, thiosulfate and sulphate. Are these difficulties actually experienced when sodium amalgam is combined with sodium polysulphide? A. I would like to identify your citation definitely there. The question?

(Thereupon the pending question was repeated.)

A. Yes, they are.

Q. In examples 1, 2 and 3, in that same exhibit E-20, there is a reference in each of these examples to solidfying by cooling or to cooling until it solidifies. Would that produce a crystallized sodium sulphide? A. Yes.

Q. And the crystals produced according to those examples could be identified as sodium sulphide? A. Yes.

Q. Now, referring to Exhibit 21, which is next in the book, on page 2, and on page 3. There are typewritten copies of run No. 1367 and run No. 1368: Were they typed out shortly before the date of this Exhibit E-21, which is dated by Dr. Cunningham on November 6, 1935 and by you on November 6, 1935? A. I couldn't say when they were typed, but probably it would be not long before November 6.

Q. Now referring to page 3 of E-21, there is on that page run No. 1368 and run 1404: How much time elapsed between run 1368 and run 1404? A. The dates in Dr. Cunningham's original note-book for 1368 would indicate that this run was done between April 22nd and April 25th, 1935, whereas the run 1404 is dated August 28, 1935.

(Thereupon there was a short informal recess at the conclusion of which the following proceedings were resumed:)

Q. Referring to the collection of exhibits E-1 to E-27, I wish you would turn to Exhibit E-6, page 2. On that page there are given a list of uses of sodium amalgam, some eight in number, and among them is included a reaction between sulphur and sodium amalgam to form sodium sulphide. Do you know how much work Dr. Cunningham did on the other six reactions on that page? A. I can't recall now just how much. That is a rather involved question. I know he worked on them definitely and there are records of his work in our files.

Q. And he was quite diligent in working on those reactions too during this period 1934 and 1935, is that correct?

A. He was working on them at that time.

71 Q. Now, referring to the red note-books that you have. The list of pages of those note-books which were introduced in evidence are dated as follows:

Cunningham Exhibit E-1, July 28, 1934.

Cunningham Exhibit E-3, August 22, 1934.

Cunningham Exhibit E-4, August 23, 1934.

Cunningham Exhibit E-5, December 11, 1934.

And then, excluding Cunningham Exhibit 7, there is Cunningham Exhibit E-8A to E-8D, dated April 22, 1935.

Now in the intervals between the dates I have just given you was Cunningham working on these other equations, experiments as shown on page 2 of Exhibit E-6? A. I will have to refer to these books to answer what he was working on.

Q. Without going into the books in detail is it probable that he was working on those other experiments during that period or those periods? A. It is possible he was.

Q. That is all for that question. Now, Dr. Cunningham is no longer with Mathieson Alkali Works, is he? A. No.

Q. When did he leave the Mathieson Alkali Works? A. About a year ago.

Q. At the time you gave your testimony in the original interference, on November 4, 1937, you had all the information in hand and could have given all the information that you gave today, could you not? A. Yes.

72 Q. And do you recall that there was nobody there to badger you there with cross-examination questions? A. No.

Q. You were testifying by yourself without the annoyance of opposing counsel? A. Yes.

Q. Is Dr. Cunningham at the present time hostile to the Mathieson Alkali Works?

The Court. What is that?

By Mr. Price:

Q. Hostile. A. Not so far as we know.

Q. When the application of Dr. Cunningham was transmitted to your company for execution, after preparation by the patent attorney, you passed on it with favor in your memorandum designated E-23. Is that a correct statement? A. Well, I don't definitely state so in the letter, but that would be the implication.

Q. And in the application you read is there some reference to selemides and tellurides as well as polyselenides and polytellurides? A. Yes, that reference appears there.

Q. Have you ever even to date seen those compounds? A. I don't remember.

Q. At the time you were supervising the work of Dr. Cunningham you were also supervising the work of nine other chemists? A. I was supervising the work of other chemists. I can't tell you the number.

73 Q. But there was a considerable number of them? A. Not a considerable number. There were, maybe, five to fifteen.

Q. Do you keep up with the literature relating to the particular problems and experiments which are being conducted in your laboratory? A. Yes, I attempt to do so.

Q. Do you keep up with "Chemical Abstracts"? A. I read that regularly.

Q. That publication comes out on the 10th and 20th of every month. How long after its publication do you read it ordinarily? A. Well, those magazines are marked by our librarian. He checks articles of interest to the various research men, and then these magazines are circulated through the staff, and, unfortunately, some of the men leave them lie on their desks for some time, so that it is occasionally a good many months before I actually get to read them myself. That varies; sometimes it is a long time; sometimes it is not.

Q. Now, "Chemical Abstracts" publishes abstracts of foreign patents, does it not? A. Yes.

Q. And in connection with the Lanzetti Italian application which became a printed patent in October, Patent No. 330,529, can you recall whether an abstract of that was published in Chemical Abstracts? A. No, sir, I can't recall.

Q. Might you have read such an abstract and forgot about it since. ? A. That would be possible.

74 Q. Would it be also possible that Exhibit E-21, which copied in typewriting runs Nos. 1367, 1368, was first prepared after it had come to your attention that Lanzetti had procured an Italian patent, through Chemical Abstracts?

The Court. What number is that? A. E-21. It is possible that was the case, but I have no memory of any foreign patent having an effect on the zeal with which we were working on the subject.

Q. Do you know anything of the applications filed by the Mathieson Alkali Works in other countries than the United States on this Dr. Cunningham process? A. I believe such were filed, but I can't recall just what ones.

Q. You can't recall what happened to them or in what countries? A. No.

Q. In your examination this morning you spoke of the fact that when you recalculated Cunningham's figures, referring to E-8-B, you found it was pretty nearly 87 per cent, but not exactly the figures given by Cunningham. Can you explain this discrepancy? A. I can explain the figure I obtained.

Q. But you cannot explain Cunningham's figures? A. I don't understand exactly how he arrived at this 87 per cent; the exact figure which he got.

Q. Are you now commercially using any of these procedures set forth on page 2 of Exhibit E-6?

Mr. Forward. I object to that question. There are a number of matters and various types of reactions
75 that have nothing to do with this case.

Mr. Price. I will withdraw the question.

By Mr. Price:

Q. In chemical formulas, such as a chemical equation, hydrogen plus oxygen is equivalent to water, it is possible for a chemist to calculate the materials he uses and the materials he obtains without going through the actual experiment. Is that a correct statement. A. Yes, I think so.

Q. And if a chemist thinks that possibly sodium polysulphide will combine with sodium amalgam to form sodium sulphide and mercury, he can also set that equation down and calculate the quantity of raw material he needs and he will obtain the answer without necessarily going through the actual experiment, is that correct? A. He can calculate the theoretical quantities, assuming the reaction is always true, but whether or not there will be that as the actual result, he cannot do that.

The Court. Are you trying to show that the Lanzetti patent is invalid?

Mr. Price. No, but I worked in the chemical division of the Patent Office and some chemists—I don't put Cunningham in that class; present company is always excluded—some chemists, I was induced to believe that some patent applications did not result from the actual experiment but were arrived at as I have indicated in the question. I don't mean to suggest that a patent is not valid for that reason.

There is no reason why a man cannot sit at his desk and invent without carrying out an actual reduction to practice.

76 By Mr. Price:

Q. In connection with the market report which is enclosed in Exhibits, as Exhibit E-25, did you have anything to do with the preparation of that? A. Probably not, because it was done in New York City.

Mr. Price. That is all with this witness, if your Honor please.

Redirect Examination

By Mr. Forward:

Q. Mr. Taylor, when one secures an aqueous solution of sodium sulphide it doesn't make any difference what the concentration is, he can always obtain crystalline hydrates if he evaporates the water by heat. Is that a correct statement? A. Yes.

Q. In other words, whether the chemical reaction will build up a high or low concentration is material only to the ultimate economic value of the process, and not as to whether you can obtain sodium sulphide in a crystal form? A. Yes, that is true.

Q. In a strict sense, when you refer to the sodium sulphide which crystallizes out from the solution, for example this 60 percent, in a strict sense that is not $Na_2$5 merely, but the reference should be to one of the various hydrates. You should refer to one of the various hydrates; is that correct? A. That is right. The water of crystallization involved is distributed through the mass of the crystals.

Q. So that when you refer to sodium sulphide generally you are including all the hydrates regardless of how much water is contained? A. That is right. 77

Q. I would like to have you refer to Plaintiff's Exhibit H, which is the stipulated testimony as to what Enzo Lanzetti would testify to if called as a witness, page 3, and particularly to the second paragraph one page 3 wherein he states that recapitulating the results of his first experiment he noticed among other things that under the conditions under which the experiment had been made the formation of mercury sulphide by reaction between mercury and the sulphur of the polysulphide. The term "mercury sulphide" is there used. Does that differentiate between mercurous sulphide and mercuric sulphide? A. No, sir, there would be no way of telling which was meant there.

Q. There isn't any difference then so long as you form "mercury sulphide"? A. That is right.

Q. And it is not an error, strictly speaking; it is merely going into detail and being more meticulous? A. Yes. The formula used by Cunningham probably would be the equivalent of the words "mercury sulphide".

Q. I wish you would refer to Exhibit E-1, which is the very first sheet of the note-book to which your attention has been directed by counsel for the defendant. I notice there is a notation "Tried to reduce sulphus with NaH_2. Sulphur floats and little reaction". Would that indicate that the sulphur was highly active with respect to mercury under all conditions; could be expected to react under all conditions with the mercury? A. That is certainly one
78 condition in which it did not react.

Q. When did you attend high school? A. I attended high school in the years 1907 to 1911.

Recross Examination

By Mr. Price:

Q. Mercuric sulphide and mercurous sulphide are definitely designated by different symbols: One by "H_gS" and the other "Hg_2S". A. I would expect that would be the designation.

Q. Is it too much work for a chemist as careful as was Dr. Cunningham to write a small subscript "2" after his "Hg" if he was producing mercurous sulphide? A. No, it wouldn't be.

Mr. Price. That is all.

I might offer certain objections to the completeness of the interference file, which we can probably correct. In my counterclaim there is a reference to certain affidavits which were attached to and presented to the Commissioner, and they are noted on No. 46, filed April 1, 1938, forming part of Plaintiff's Exhibit F, where there is a reference to the affidavits. I would like to stipulate that since these affidavits are not included in the file but are referred to in my counterclaim—

The Court (interposing). Your counterclaim, as I understand it, is a suit for infringement?

Mr. Price. I will come to that. This is essentially my counterclaim. The statute was changed in June, 1938, to provide for a declaratory judgment action under Section 274-D. Now, it happens that in my counterclaim as orig-
inally set up, before the patent was issued, Patent
79 No. 2,227,547, there was reference to the effective
date to which Lanzetti was entitled. Now, in view
of the declaratory judgment statute, and in view of the offered stipulation of counsel, I am of the opinion that we are before this Court and the interest of my client in its patent should be adjudicated.

The Court. I will read this. I don't think this is a suit for infringement.

Mr. Price. I am going to ask the Court under the greatly liberalized provisions of the statute, under the decisions and under Section 4915—this Court has the parties before it and has jurisdiction of the subject matter—and under the greatly liberalized provisions of the rules I am going to ask for the privilege of making a slight amendment here. No. 1, I am going to ask to amend that counterclaim to set up therein, as indicated would be presumably satisfactory, in Mr. Forward's letter of March 11, 1941, that this counterclaim might now be amended to set up Patent No. 2,227,547 issued on January 7, 1941, upon the Lanzetti American application filed April 15, 1936.

Mr. Forward. That is not the stipulation. If you will take the whole letter you will find that that suggestion was predicated on the fulfillment of other conditions which have since failed; that it was agreed that there was no evidence of infringement. And we do not now propose to stipulate to any such amendment. It is my understanding that there is to be no evidence of infringement in any event. Mr. Taylor has testified that they are not using this process, or product. In addition there isn't here any form of adversary action as required. There can be no basis for a 80 declaratory judgment under the circumstances.

Mr. Price. I am withdrawing my claim of infringement, but I think I have made a showing here that a controversy exists, the determination of which directly affects the interest of my client and our claim under Patent No. 2,227,547.

Now, that patent issued after the original counterclaim or the original pleadings in this action were filed. I am making no charge of infringement, but I do say that under this counterclaim, as it should be amended, that there is an actual controversy which directly affects the interest of my client in the patent and which justifies this Court in taking cognizance of it. I intend to rely on the case of Shimadzu vs. Electric Storage Battery Company; but I would like to make a motion to amend and leave it to your Honor to consider it when the briefs are filed.

The Court. You may make your motion to amend; I will pass on it.

Mr. Price. I would like to amend the present counterclaim to substitute for the application referred to therein, Patent 2,227,547, as issued on January 7, 1941; and I would also like to have this patent marked as my Exhibit No. 2.

(Patent marked Defendant's Exhibit 2 and received in evidence.)

In lieu of this motion I would like to move to amend by substituting the supplementary counterclaim which I will hand to the Court herewith in lieu of the present counterclaim.

I am withdrawing the allegations in respect to the charges of infringement in that counterclaim, although I am pressing the allegations in respect to the controversy directed to the validity of this patent.

Now, it happens in my original counterclaim—and on
that matter I will brief that for your Honor and I
81 will rely on the recent Supreme Court case of Shimadzu vs. Electric Storage Battery Company.

(Proposed supplemental counterclaim marked Defendant's Exhibit 1 and received in evidence.)

Mr. Price. Now with respect to the stipulated testimony I can't see how a stipulation can be submitted in part and not have the whole go in, but if it is not to go in as plaintiff's exhibit I would like to introduce it as my exhibit, that is the balance of the stipulation or and concerning the testimony of Biancard and Lanzetti.

(Defendants Exhibit 2 offered in evidence.)

Mr. Forward. I assume they are accepted subject to the objections that are incorporated in Exhibits H and I.

The Court. I will pass on them when I pass on the other questions.

Mr. Price. And I would like to have these marked: Lanzetti as Defendant's Exhibit 3; and this, Biancard, Defendant's Exhibit No. 4.

(Stipulations re testimony marked Defendant's Exhibits 3 and 4 and received in evidence.)

Mr. Price. There was certain other stipulated testimony. May I put them in the record. I would like to introduce the stipulation as to the testimony of Luigi Achille as Defendant's Exhibit 5.

Mr. Forward. Objected to as having no materiality to any issue here involved. It only concerns something allegedly done in Italy prior to the Italian filing date.

The Court. I will pass on it.

(Stipulation re testimony Luigi Achille marked Defendant's Exhibit 5 and received in evidence.)

82 Mr. Price. I would like to introduce the stipulation as to the testimony of Enrico Rosetti, Gennaro Bernasconi, Agostino Balzarotti and Mario Bansoni as Defendant's Exhibit 6.

(Stipulation re testimony marked Defendant's Exhibit 6 and received in evidence.)

Mr. Price. I assume that is subject to the same objection.

Mr. Forward. Yes, and the further objection that the assorted testimony is entirely hearsay, as appears from the face of the stipulation.

The Court. I will pass on that also at the same time.

Mr. Price. And as Defendant's Exhibit 7 the stipulated testimony of Leonetti Ciucci.

Mr. Forward. Subject to the same objection.

(Stipulation re testimony of Ciucci marked Defendant's Exhibit 7 and received in evidence.)

Mr. Price. I would like to stipulate that the affidavits referred to in the paper No. 46 of Plaintiff's Exhibit F, and also referred to as Exhibit A, in paragraph 14 of the first and present counterclaim corresponds substantially to Exhibits 3, 5, and 7.

Mr. Forward. I will stipulate that the substance of these affidavits has been incorporated into the stipulations that if they were called they would so testify.

Mr. Price. That is satisfactory.

I would also like to include either as my exhibit or by stipulation part of Plaintiff's Exhibit F, the requests for rehearing of which two were filed, together with the decisions of the Board of Appeals on the petitions. I would like to introduce that as my Exhibit 8.

83 Mr. Forward. I can readily understand the purpose of including the decisions, and I have no objection to that. However, I do object to having the whole thing go in the record.

Mr. Price. The purpose is to show that the arguments presented to your Honor as to why the action of the Board should be reversed was made below; and I think it will be of some assistance to the Court.

Mr. Forward. It amounts to incorporating two lengthy briefs in the record. I am willing to have the decisions in, and I don't see any reason for repeating that argument in the record where it will just burden the record if it has to be printed.

Mr. Price. I will stipulate that if the record has to be printed that anything other than the decisions of the Board may be omitted.

The Court. I should like to have the benefit of those briefs.

Mr. Forward. He is not including the main brief before the Examiner on interference or the Board; it is only the briefs on the one point of law.

Mr. Price. Have you the brief? I will offer it.

The Court. They will be admitted subject to your objection.

(Two requests for rehearing and decisions thereon by the Patent Office Board of Appeals marked Defendant's Exhibit 8 and received in evidence.)

Mr. Price. Now this document, proposed Exhibit 9——

Mr. Forward. This document, proposed Exhibit 9, was presented to me only just last Saturday; I have not had an opportunity to examine it. I would go this far.
84 I would stipulate that incorporated in this Patent
Office record, Plaintiff's Exhibit F, attached to the motion to shift the burden of proof, there was included what purported to be a certified copy of the original Italian application, and for four years we objected to that, and now, last Saturday, they produce this document which is asserted to be a copy of the original, and I haven't had an opportunity to examine it carefully. I will stipulate that it does in its specifications differ from the alleged copy of the

original filed in the Patent Office but not in any respects material to the issues here involved.

Mr. Price. I would like to introduce as Defendant's Exhibits 9 and 10 certified copies of the Italian application and Italian patent subject to any objection or correction to be made by the attorney for plaintiff directed to the fact that they differ in any respect whatsoever from the subject matter submitted on the motion to shift the burden of proof.

Mr. Forward. The record already includes one copy of it; isn't that the one? Wasn't that filed in the Patent Office?

Mr. Price. No.

(Certified copies Italian application and Italian patent marked Defendant's Exhibits 9 and 10 respectively and received in evidence.)

The Court. Am I supposed to pass on these certificates? I haven't studied Italian in a long time.

Mr. Price. I think we will stipulate that those certificates will be about the same as those already in the record. And we can agree as to the form of stipulation concerning further testimony of Ciucci referred to in paragraph 4 of the stipulation already on file in this Court, being dated April 25, 1941.

85 We can agree on this stipulation between ourselves and file it as to paragraph 4.

(Stipulation re further testimony of Ciucci and reports attached thereto marked Defendant's Exhibit 11 and received in evidence.)

Your Honor, I think that finishes the case, and I am sorry that I have been ill at ease here, thinking of other pressing matters.

The Court. When will you gentlemen get your briefs in?

Mr. Price. I think I am going to be busy for the next week or so.

The Court. I don't want to wait until summer vacation to work on this case.

Mr. Forward. May we have until June 10th?

The Court. And answer by June 15th?

Mr. Price. Could I make it a little later, two or three days, June 17th?

The Court. The first briefs will be in by the 9th of June, and you will have until the 16th to answer.

Mr. Price. I want to thank your Honor for your courtesy and patience in listening to this case.

(Thereupon, at 12:30 o'clock p. m., the hearing was concluded.)

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86 Endorsed: Filed Feb 10 1942 Charles E. Stewart, Clerk

In the District Court of the United States
For the District of Columbia

Civil Action No. 3309

THE MATHIESON ALKALI WORKS, INC., *Plaintiff,*

v.

LUIGI ACHILLE, *Defendant.*

Order

It is hereby ordered that The Mathieson Alkali Works, Inc., appellant in the above-entitled cause of action, be permitted to withdraw the original exhibits filed in behalf of Plaintiff-Appellant for the purpose of filing them in the United States Court of Appeals for the District of Columbia for use in the appeal thereto, in lieu of copies thereof.

JENNINGS BAILEY,
Justice.

Washington, D. C.
February 10, 1942.

87 Endorsed: Filed Feb 10 1942 Charles E. Stewart, Clerk

In the District Court of the United States
For the District of Columbia

Civil Action No. 3309

The Mathieson Alkali Works, Inc., *Plaintiff,*

v.

Luigi Achille, *Defendant.*

Order

It is hereby ordered that the time in which the appeal of The Mathieson Alkali Works, Inc. may be docketed in the United States Court of Appeals for the District of Columbia be, and the same hereby is extended to March 19, 1942.

JENNINGS BAILEY,
Justice.

Washington, D. C.
February 10, 1942.

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88 Endorsed: Filed Mar 10 1942 Charles E. Stewart, Clerk

In the District Court of the United States
For the District of Columbia

Civil Action No. 3309

The Mathieson Alkali Works, Inc., *Plaintiff,*

v.

Luigi Achille, *Defendant-Appellee*

Order Extending Time for Docketing Appeal

It is hereby ordered that the time in which the appeal of The Mathieson Alkali Works, Inc. may be docketed in the United States Court of Appeals for the District of

Columbia be, and the same hereby is extended to April 8, 1942.

JENNINGS BAILEY,
Justice.

Washington, D. C.
March 16, 1942.

89 Endorsed: Filed Feb 10 1942 Charles E. Stewart, Clerk

In the District Court of the United States
For the District of Columbia

Civil Action No. 3309

The Mathieson Alkali Works, Inc., *Plaintiff,*

v.

Luigi Achille, *Defendant.*

Designation of Record

Clerk, Dist. Court of the U. S.
for the Dist. of Columbia:

You are hereby requested to certify the Transcript of Record and proceedings in the above-entitled cause of action to be filed in the United States Court of Appeals for the District of Columbia for use in the appeal thereto, and to include in such Transcript the following items, which shall be considered sufficient for the determination of the questions raised on appeal, namely:

(1) Bill of Complaint, filed June 30, 1939.
(2) Answer to Complaint, filed October 30, 1939.
(3) Opinion of Justice Bailey, filed July 7, 1941.
(4) Findings of fact and conclusions of law, filed December 9, 1941.
(5) Final decree, filed December 9, 1941.
(6) Supplemental final decree, filed January 8, 1942.
(7) Memorandum and notice of appeal, filed January 8, 1942.

(8) Memorandum of giving cost bond on January 8, 1942.

(9) The reporter's transcript of testimony.

(10) Plaintiff's Exhibits A, B, C, D, E, F, G, H
90 and I.

(11) Memorandum of order of Court permitting original exhibits to be filed in the United States Court of Appeals for the District of Columbia in lieu of copies thereof.

(12) Memorandum of order of Court extending time for docketing appeal to March 19, 1942.

CLARENCE M. FISHER,
Attorney for The Mathieson
Alkali Works, Inc., Appellant.
National Press Bldg.,
Washington, D. C.

Washington, D. C.
February 10, 1942.

I hereby certify that a copy of this Designation of Record was this 10th day of February, 1942, forwarded by Registered Mail to Harry Price at 420 Lexington Avenue, New York, New York, attorney for Appellee, Luigi Achille, the Appellee not being represented by local counsel.

CLARENCE M. FISHER.

91 District Court of the United States
For the District of Columbia

UNITED STATES OF AMERICA,
District of Columbia, ss:

I, Charles E. Stewart, Clerk of the District Court of the United States for the District of Columbia, hereby certify the foregoing pages numbered from 1 to 90, both inclusive, (excepting the transcript of testimony, as to the accuracy of which counsel has certified) to be a true and correct transcript of the record, according to directions of counsel herein filed, copy of which is made part of this transcript, and in accordance with Rule 75(g) of the Federal Rules of Civil Procedure for the District Courts of the United States, in Civil Action No. 3309, wherein The Mathieson Alkali Works, Inc. is Plaintiff and Luigi Achille is Defendant, as the same remains upon the files and of record in said Court, except the following:

Plaintiff's Exhibits A to I, both inclusive, the originals of which have been ordered transmitted to the United States Court of Appeals for use on appeal in said action in lieu of copies.

In testimony whereof, I hereunto subscribe my name and affix the seal of said Court, at the City of Washington, in said District, this 1st day of April, 1942.

C. E. STEWART,
(Seal) *Clerk.*

92 District Court of the United States
For the District of Columbia

UNITED STATES OF AMERICA,
District of Columbia, ss:

I, Charles E. Stewart, Clerk of the District Court of the United States for the District of Columbia, hereby certify the attached Exhibits A to I, both inclusive, to be the original exhibits of plaintiff in Civil Action No. 3309, wherein The Mathieson Alkali Works, Inc. is Plaintiff and Luigi Achille is Defendant, which exhibits said Court ordered transmitted to the United States Court of Appeals for use on appeal in said action in lieu of copies.

In testimony whereof, I hereunto subscribe my name and affix the seal of said Court, at the City of Washington, in said District, this 1st day of April, 1942.

C. E. STEWART,
(Seal) *Clerk.*

PLAINTIFF'S EXHIBIT A

93 Endorsed: Filed Feb 10 1942 Charles E. Stewart, Clerk

In the United States District Court
For the District of Columbia

Civil Action No. 3309

THE MATHIESON ALKALI WORKS, INC., *Plaintiff,*

v.

LUIGI ACHILLE, *Defendant.*

Stipulation

The parties hereto hereby stipulate, that, for the purpose of this suit, the plaintiff, The Mathieson Alkali Works, Inc., is incorporated and is a resident as stated in Paragraph I of the complaint, and that it is the sole owner of record of the entire right, title and interest in and to the application for United States Letters Patent, Serial No. 62,308, entitled Chemical Manufacture, filed on February 4, 1937 by George Lewis Cunningham, as stated in Paragraph I of the complaint;

That the defendant, Luigi Achille, is a resident as stated in Paragraph II of the complaint, and is the sole owner of record of the entire right, title and interest in and to the application for United States Letters Patent filed in the United States Patent Office by Enzo Lanzetti on April 15, 1936, Serial No. 74,592, entitled Process For Producing Alkali Metal Sulfides, as stated in Paragraph II of the complaint;

That the assignment in writing identified in Paragraph VI of the complaint was executed as stated in Paragraph VI of the complaint; and,

94 That the written instrument dated March, 1936, identified in Paragraph VIII of the complaint, was

duly executed, delivered and recorded as stated in Paragraph VIII of the complaint.

PENNIE, DAVIS, MARVIN & EDMONDS,
Attorneys for Plaintiff
CLARENCE M. FISHER
834 National Press Budg.
HARRY PRICE
Attorney for Defendant

PLAINTIFF'S EXHIBIT B

95 Endorsed Filed Feb. 10, 1942, Charles E. Stewart, Clerk.

Department of Commerce
United States Patent Office

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the File Wrapper and Contents, in the matter of the Application of George Lewis Cunningham, Filed February 4, 1936, Serial Number 62,308, for Improvement in Chemical Manufacture.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this fifth day of March, in the year of our Lord one thousand nine hundred and forty-one and of the Independence of the United States of America the one hundred and sixty-fifth.

(Seal) CONWAY P. COE,
Commissioner of Patents.

Attest:
D. E. WILSON,
Chief of Division.

96 Number (Series of 1935)
Patent No. ....
(Ex'r's Book) 16
Div. 59
Name George Lewis Cunningham Anns to The Mathieson Alkali Works, Inc., New York, N. Y., a Corp. of Virginia.
....
....
....
of Niagara Falls
State of New York
Invention Chemical Manufacture
Original application filed complete Feb. 4, 1936.
Petition, Specification, Oath, First Fee $30, 1 sheet Drawings, Feb. 4, 1936.
Parts of application filed
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....
Examined and passed for Issue........, 193..
...................Exr. Div. ....
Notice of Allowance........... X 495............, 193..
By Commissioner.
Final Fee ...., 193..
Renewed
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Reexam'd and passed for Issue..................,193..
...............................Exr. Div. ....
Notice of Allowance...................., 193..
By Commissioner.

Final Fee ...., 193..
Attorney Pennie, Davis, Marvin & Edmonds, 165 Broadway, New York, N. Y.

....

No. of Claims Allowed.. Print Claims.... in O.G. Class..
Title as allowed................................

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Division of App., No.............., filed..........., 19..

97 Endorsed: Filed Feb 4 1936

Pennie, Davis, Marvin and Edmonds

Counsellors at Law

165 Broadway

New York

Washington Office

National Press Building

Albert G. Davis,
Counsel.

William H. Davis
Arba B. Marvin—*Retired*
Dean S. Edmonds
Frank E. Barrows
W. Brown Morton
Merton W. Sage
Willis H. Taylor, Jr.
Ernest H. Merchant
George E. Middleton
Morris D. Jackson
R. Morton Adams
Raymond F. Adams
Leslie B. Young
Daniel V. Mahoney

Raymond B. Canfield
Baldwin Guild
Ambrose A. Arnold
S. Howell Brown, Jr.
Louis D. Forward
H. Stanley Mansfield
George E. Faithfull
Donal F. McCarthy
John Hoxie
John T. Farley
Curt Von Boetticher, Jr.
James B. Christie
Roger T. McLean

February 3, 1936

Honorable Commissioner of Patents,
Washington, D. C.

Sir:

We are forwarding herewith for filing an application of George L. Cunningham relating to "Chemical Manufacture" executed January 30, 1936. The application comprises a Petition, Specification, an Oath and one sheet of drawings. Our check for $30 to cover the filing fee is enclosed.

Respectfully,

Pennie, Davis, Marvin and Edmonds.

Encs.

98 Endorsed: Filed Feb 4 1936 U. S. Patent Office.

Petition

To the Commissioner of Patents:

Your petitioner, George L. Cunningham, a citizen of the United States, residing at 735 Fourth Street, Niagara Falls, in the County of Niagara, State of New York, whose Post Office address is c/o The Mathieson Alkali Works, Inc., Niagara Falls, New York, prays that Letters Patent may be granted to him for improvements in Chemical Manufacture as set forth in the annexed specification.

And he hereby appoints William H. Davis, Dean S. Edmonds, Frank E. Barrows, W. Brown Morton, Merton W. Sage, Willis H. Taylor, Jr., Ernest H. Merchant, George E. Middleton, Morris D. Jackson, R. Morton Adams, Raymond F. Adams, Leslie B. Young, Daniel V. Mahoney and Albert G. Davis (constituting the firm of Pennie, Davis, Marvin & Edmonds, 165 Broadway, New York City, Registration No. 10839) and each of them, his Attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign the drawings, to receive the Patent, and to transact all business in the Patent Office connected therewith.

GEORGE LEWIS CUNNINGHAM
(Inventor's Full Name)

Specification

D 3844

To All Whom it May Concern:

BE IT KNOWN, that I, George L. Cunningham, a citizen of the United States, residing at 735 Fourth Street, Niagara Falls, in the County of Niagara, State of New York, have invented certain new and useful improvements in Chemical Manufacture and I do hereby declare the following to be a full, clear and exact description of the invention, such as will enable others skilled in the art to which it appertains, to make and use the same:

99 This invention relates to improvements in the manufacture of sulphides, selenides and tellurides of the alkali metals. These salts are used, for example, in the manufacture of dyestuffs and in the dehairing and tanning of hides. At present, sodium sulphide is probably the most important, commercially, of these salts. It is manufactured, commonly, by heating sodium sulphate, salt cake, with coke in a fuel-fired furnace at a temperature limited to avoid the rapid fluxing of the refractory lining of the furnace, cooling and crushing the furnace product, dissolving it in water, filtering the solution and crystallizing the sodium sulphide product from the filtered solution, to produce a product containing about 32.5% Na_2S or, after concentration, to produce a product containing about 60-62% Na_2S. The low temperatures consistent with reasonable refractory life involve low yields and low furnace capacity.

This invention provides an improved process for manufacture of sodium sulphide, for example, which enables the production of high yields of a product of high purity with good operating economy and which is not hampered, in practical application, by limitations such as the fluxing characteristics of refractories.

According to this invention, sodium sulphide is produced by reacting sodium amalgam with sodium polysulphide [in an aqueous medium.] The polysulphide is thus reduced to the normal sulphide, the reaction product including a total proportion of sodium sulphide approaching that equivalent, stochiometrically, to the total sulphur content of the sodium polysulphide supplied to the reaction. The reaction may be typified as follows:

Sodium Amalgam $+ Na_2Sx = X\ Na_2S +$ Mercury.

100 In the complete process of the invention, a part of the normal sulphide thus produced is separated as the product of the process and the remainder is used to form, by reaction with sulphur, the polysulphide supplied to the reaction with the sodium amalgam. In effect, the invention thus provides for the direct production of sodium sulphide from sodium, supplied to the process as sodium amalgam, and elemental sulphur, supplied to the process as such. The reaction to form the polysulphide and the reduction of the polysulphide with the sodium amalgam can, in fact, be carried out concurrently. The sodium amalgam can be produced by any convenient mercury cathode electrolysis, the Castner process or the Krebs process for example.

The following examples of specific embodiments of the process of the invention will illustrate the invention:

EXAMPLE I.

33.8 parts (by weight) of water and 6.64 parts of sulphur are added to a solution of 16.2 parts of sodium sulphide, Na_2S, in 33.8 parts of water and this mixture is heated until the added sulphur is dissolved. The resulting red solution of sodium polysulphide, Na_2Sx, is reacted with a sodium amalgam containing 0.1% (by weight) of sodium at 80°C. until 9.54 parts of sodium have been added, the solution then being colorless. 50 parts of this solution are separated from the remainder and cooled until solidified. This solid product corresponds to the 32.5% Na_2S of commerce. Water and sulphur are added, as first stated, to the remainder of the solution and the process is repeated.

EXAMPLE II.

101 33.8 parts of water and 6.64 parts of sulphur are added to a solution of 16.2 parts of sodium sulphide in 33.8 parts of water and this mixture is heated, at 90°C., until the added sulphur is dissolved. The resulting polysulphide solution is reacted with a sodium amalgam containing 0.3% of sodium at 80°C. until 9.54 parts of sodium have been added. 50 parts of this solution are separated from the remainder, 23 parts of water are evaporated from the separated part, and the resulting concentrated solution is cooled until it solidifies. This solid product corresponds to the 60% Na_2S of commerce. Water and sulphur are added, as first stated, to the remainder of the solution and the process is repeated.

EXAMPLE III.

67.7 parts of sulphur are added to a solution of 78.06 parts of sodium sulphide in 162 parts of water and this mixture is reacted at 125°C. with a sodium amalgam containing 0.2% of sodium until 97.3 parts of sodium have been added. 405 parts of a 60% Na_2S solution are thus produced. 275 parts of this solution are separated and cooled until solidified. 110 parts of water are added to the remainder of the solution and the process is repeated with this diluted remainder.

The first two of the foregoing examples illustrate operations in which the polysulphide is first formed and then reacted with the sodium amalgam; the third an operation in which the formation of the polysulphide and the sodium amalgam reaction are effected concurrently.

The accompanying drawing also illustrates, in flow diagrams, operations embodying the invention, Fig. 1 representing operations such as those of the first two of the foregoing examples and Fig. 2 a modification of such operations. In the operation illustrated in Fig. 1, sodium
102 amalgam from the electrolysis 1 and sodium polysulphide from the dissolver 2 are supplied to the reducer 3, sodium sulphide solution from the reducer 3 is supplied in part to the cooler or evaporator 4 and in part to the dissolver 2, mercury from the reducer 3, after washing in the washer 5, is returned to the electrolysis 1, and wash water from the washer 5 and sulphur are supplied to the dissolver 2 there to form, with the returned part of the sodium sulphide solution from the reducer 3, the sodium polysulphide supplied to the reducer 3. The same parts, or steps, are designated, in Fig. 2, by the same reference numeral with the letter *a* appended. In the operation illustrated in Fig 2, the sodium sulphide solution from the reducer 3a is cooled in cooler 6, precipitated sodium sulphide is separated from this cooled solution in centrifuge 7, and the remaining sodium sulphide solution is returned to the dissolver 2a.

The efficiency of the process can be improved by observing certain precautions. Oxygen, as air or otherwise, should be excluded from contact with both the sulphide and the polysulphide solutions because of the tendency of such solutions to form thiosulphates, sulphites and sulphates by oxidation. Such oxidation involves not only the loss of materials but also the introduction of impurities into the product. As the amalgam approaches complete discharge, in the reduction reaction, the mercury tends to form mercury sulphide which in turn tends to dissolve in the sodium sulphide solution. These tendencies can be avoided by maintaining an adequate supply of sodium amalgam to the reduction reaction. Any mercury sulphide formed and dissolved can be discharged from the sulphide solution by reaction with sodium amalgam. Discharge of the so-
103 dium amalgam with evolution of hydrogen and

formation of sodium hydroxide is also to be avoided or minimized, as such discharge, to whatever extent it occurs, introduces sodium hydroxide into the product as an impurity and lowers the efficiency with respect to sodium. To this end, the vessel in which the reduction reaction is carried out should preferably be so constructed and arranged that no electrically conducting material contacts, electrically, the amalgam and the sulphide or polysulphide solution at the same time. The surface of the amalgam, in the vessel in which the reduction reaction is effected, must of course be kept free of dirt and scum. Although the reduction reaction becomes very slow at very low temperatures, approaching 0°C. for example, temperatures within the range up to the boiling point of the solution, under the prevailing pressure, are useful in carrying out the invention. Amalgams up to the limits of concentration which can be prepared by electrolysis are useful in carrying out the invention. In carrying out the process, elemental sulphur, and similarly elemental selenium or tellurium in the production of selenides and tellurides, can be supplied to the reaction forming the polysulphide, or polyselenide or polytelluride, in any convenient form.

The sulphides of the other alkali metals, potassium and lithium for example, can be manufactured by the same process, using the corresponding amalgam in place of sodium amalgam, and the selenides and tellurides of the alkali metals can be similarly manufactured, reducing the polyselenide or polytelluride with the chosen alkali metal amalgam and forming the polyselenide or polytelluride by reacting the selenide or telluride with elemental selenium or tellurium.

104 In the appended claims, the term "sulphur-like element" is used to embrace the class consisting of sulphur, selenium and tellurium and the terms "sulphide-like salt" and "polysulphide-like salt" are used to embrace, respectively, the class consisting of the sulphides, selenides and tellurides and the class consisting of the polysulphides, polyselenides and polytellurides.

105 I claim:

1. In the manufacture of alkali metal sulphides, selenides and tellurides, the improvement which comprises reacting an alkali metal amalgam with the corresponding polysulphide, polyselenide or polytelluride [in an aqueous medium] to form the sulphide, selenide or telluride of that alkali metal.

2. In the manufacture of sulphide-like salts of the alkali metals, the improvement which comprises reacting an alkali metal amalgam with the corresponding polysulphide-like salt [in an aqueous medium] to form the sulphide-like salt of that alkali metal.

3. In the manufacture of sulphide-like salts of the alkali metals, the improvement which comprises reacting an alkali metal amalgam with the corresponding polysulphide-like salt [in an aqueous medium] to form the sulphide-like salt of that alkali metal, separating part of the sulphide-like salt formed and reacting another part with the sulphur-like element [in an aqueous medium] to form the polysulphide-like salt supplied to the reaction with the amalgam.

4. In the manufacture of alkali-metal sulphides, the improvement which comprises reacting an alkali metal amalgam with the corresponding polysulphide [in an aqueous medium] to form the sulphide of that alkali metal.

5. In the manufacture of alkali metal sulphides, the improvement which comprises reacting an alkali metal amalgam with the corresponding polysulphide [in an aqueous medium] to form the sulphide of that alkali metal, separating part of the sulphide formed and reacting another part with sulphur [in an aqueous medium] to form the polysulphide supplied to the reaction with the amalgam.

106 6. In the manufacture of sodium sulphide, the improvement which comprises reacting sodium amalgam with sodium polysulphide [in an aqueous medium] to form sodium sulphide.

7. In the manufacture of sodium sulphide, the improvement which comprises reacting sodium amalgam with sodium polysulphide [in an aqueous medium] to form sodium

sulphide, separating part of the sodium sulphide formed and reacting another part with sulphur [in an aqueous medium] to form the polysulphide supplied to the reaction with the amalgam.

8. In the manufacture of alkali-metal sulphides, selenides and tellurides, the improvement which comprises reacting an alkali metal amalgam with the corresponding sulphide, selenide or telluride and sulphur, selenium or tellurium [in an aqueous medium] to form additional sulphide, selenide or telluride.

9. In the manufacture of sulphide-like salts of the alkali metals, the improvement which comprises reacting an alkali metal amalgam with the corresponding sulphide-like salt and the corresponding sulphur-like element [in an aqueous medium] to form additional sulphide-like salt of that alkali metal.

10. In the manufacture of alkali-metal sulphides, the improvement which comprises reacting an alkali metal amalgam with the corresponding sulphide and sulphur [in an aqueous medium] to form additional sulphide.

11. In the manufacture of sodium sulphide, the improvement which comprises reacting sodium amalgam with the corresponding sulphide and sulphur [in an aqueous medium] to form additional sodium sulphide.

107 In Testimony Whereof I affix my signature.

GEORGE LEWIS CUNNINGHAM
(Inventor's Full Name)

Oath

STATE OF NEW YORK,
County of Niagara: ss.

I, George L. Cunningham the above-named petitioner, being duly sworn, depose and say that I am a citizen of the United States, and a resident of Niagara Falls, New York, and that I verily believe myself to be the original, first and sole inventor of the improvements in Chemical Manufacture described and claimed in the annexed specification; that

I do not know and do not believe that the same was ever known or used before my invention or discovery thereof, or patented or described in any printed publication in any country before my invention or discovery thereof, or more than two years prior to this application or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by me or my legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvements has been filed by me or my representatives or assigns in any country foreign to the United States.

GEORGE LEWIS CUNNINGHAM
(Inventor's Full Name)

Subscribed and sworn to before me this 30th day of Jan. 1936.

(Notary Seal)

H. H. Hackenheimer
(Signature of Notary Public)

....
(Official Character)

62308 59 85

1 - 1

16
46

Print of drawing as originally filed #2

Fig. 1.

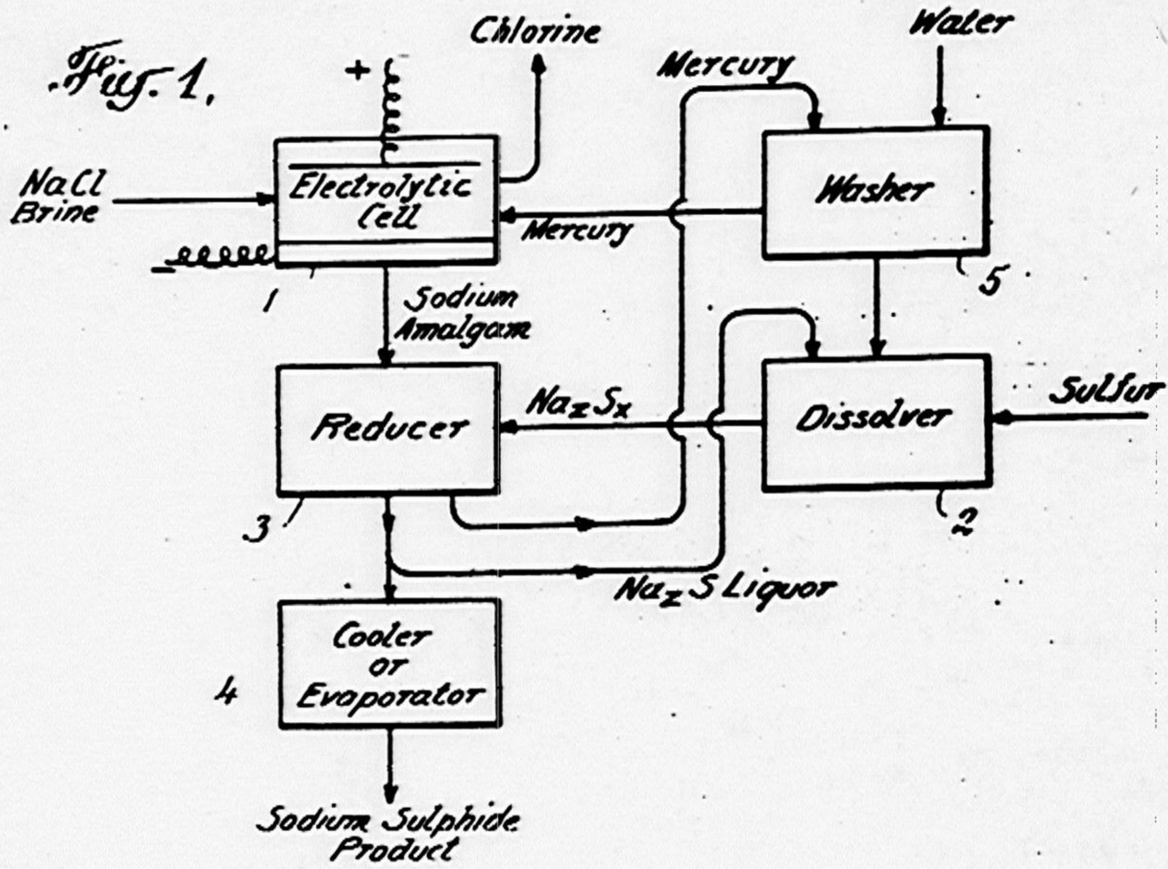
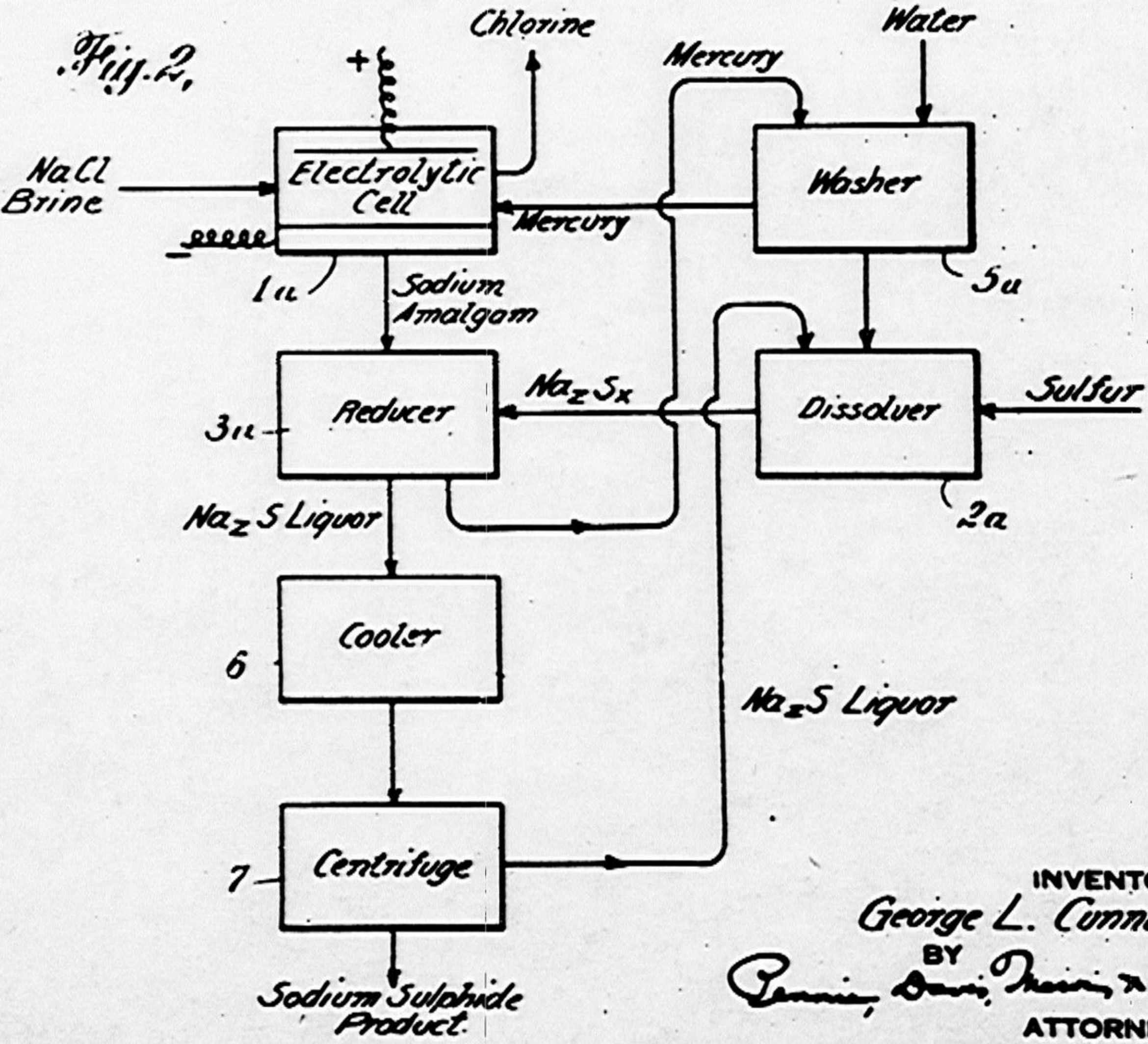


Fig. 2.



INVENTOR
George L. Cunningham
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

109 Endorsed: Mailed Apr 17 1936

Department of Commerce
United States Patent Office
Washington

Applicant: George L. Cunningham
Ser. No. 62,308
Filed Feb. 4, 1936
For Chemical Manufacture.
Pennie, Davis, Marvin & Edmonds,
165 Broadway,
New York, N. Y.

This application has been examined and the following references are cited:

Mellor "Comprehensive Treatise on Inorganic and Theoretical Chemistry", Vol. II—pages 621, 622, 629, 632, 633 (1922) Vol. IV—pages 1018 and 1019 (1923)

Copy in Division 59.

Frazier 1,614,063 Jan. 11, 1927 23/134 u.x.r.

It is old to prepare alkali metal or sodium sulfide by reacting alkali metals or sodium with sulfur, or NaOH with sulfur as shown by Mellor, Vol. II, pages 621, 622, 633. On page 632 (Vol. II) is disclosed the addition of sodium to a solution of sodium tetrasulfide and formation of sodium disulfide thereby. All claims are rejected as unpatentable over this disclosure in Mellor Vol. II because substituting sodium amalgam is merely the obvious use of an equivalent of sodium. Sodium amalgam behaves as though it were a solution of sodium in mercury as shown by Mellor Vol. IV, pages 1018 and 1019. Under these circumstances no invention is involved in utilizing sodium amalgam as a convenient source of sodium in preparing sodium sulfide in the manner disclosed by Mellor Vol. II.

Frazier discloses reacting sodium sulfide, sodium carbonate, and sulfur. All claims are rejected as unpatentable over Frazier because in view of Mellor no invention is involved in substituting sodium or its equivalent, sodium amalgam, for Frazier's sodium carbonate.

Claims 2, 3 and 9 are also rejected as indefinite in "sul-
phide-like salts" because this term has no definite
110 or recognized meaning and its scope is consequently
uncertain.

P. W. SHEPARD
Examiner.

111 Endorsed: Mailed Apr 20 1936

Department of Commerce
United States Patent Office
Washington

Applicant: George L. Cunningham
Ser. No. 62,308
Filed Feb. 4, 1936
For Chemical Manufacture.
Pennie, Davis, Marvin & Edmonds,
165 Broadway,
New York, N. Y.

Supplemental to Office action of April 17, 1936.
Additional references cited:
Williams 1,939,839 Dec. 19, 1933 196/23
Massenet (Ger.) 421,263 Nov. 9, 1925 196/26
(3 pp. spec.—no drg.)

All claims are additionally rejected as unpatentable over Williams or Massenet (Ger.) supra each of which shows desulfurizing oils by mixing with sodium amalgam thereby forming free mercury and sodium sulphide compounds. To react any other sulphur compound having sulphur available for combination such as sodium polysulfides or free sulphur with sodium amalgam in the manner taught by the above references is clearly uninventive, especially in view of Mellor of record or Frazier.

Time for response runs from the date of this action.

P. W. SHEPARD,
Examiner.

112 Endorsed: Mail Division Oct 3-36 U. S. Patent Office

Endorsed: U. S. Patent Office Oct 6 1936

In the United States Patent Office

In re application of
George L. Cunningham
Serial No. 62,308
Filed Feb. 4, 1936
Div. 59 Room 4709
For: Chemical Manufacture

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In response to the Official Action of April 17th, 1936 and the supplemental Official Action of April 29th, 1936, please amend the above-identified application as follows:

In the specification:

Page 1, line 24, after "polysulphide" and before the period insert—in an aqueous medium—

Page 5, line 6, before "preferably" insert—should—

In the claims:

Claim 1, line 4, after "polytelluride" insert—in an aqueous medium—

Claim 2, line 4, after "salt" insert—in an aqueous medium—

Claim 3, line 4, after "salt" insert—in an aqueous medium—; line 6, before "element" change "sulphide-like" to—sulphur-like—; and after "element" insert—in an aqueous medium—

Claim 4, line 3, after "polysulphide" insert—in an aqueous medium—

113 Claim 5, line 3, after "polysulphide" insert—in an aqueous medium—

line 5, after "sulphur" insert—in an aqueous medium—

Claim 6, line 3, after "polysulphide" insert—in an aqueous medium—

Claim 7, line 3, after “polysulphide” insert—in an aqueous medium—

line 5, after “sulphur” insert—in an aqueous medium—

Claim 8, line 5, after “tellurium” insert—in an aqueous medium—

Claim 9, line 4, after “element” insert—in an aqueous medium—

Claim 10, line 3, after “sulphur” insert—in an aqueous medium—

Claim 11, line 3, after “sulphur” insert—in an aqueous medium—.

Remarks

Reconsideration is respectfully requested.

In order to state more precisely his intended meaning, applicant has inserted the phrase “in an aqueous medium” in line 24 of page 1 of the specification and in each of the claims. A reading of the specification makes it apparent that applicant's process is carried out only in an aqueous medium. This is further evident from the three examples given, in each of which an aqueous solution is employed.

114 The Examiner has rejected the claims on the basis of disclosures by Mellor, stating that “It is old to prepare alkali metal sulfide by reacting alkali metals with sulfur”. Applicant admits that it is an old and well known reaction to prepare alkali metal sulfides by reacting alkali metal with sulfur. This reaction has of necessity always been accomplished either in a non-aqueous solution or in the absence of any solvent at all. All of the references cited by the Examiner bear out this statement. The process of this application is carried out only in an aqueous solution. Applicant has attempted to produce sodium sulfide by reacting sodium with sulfur in the presence of water. The result obtained, as could be predicted, was violent evolution of hydrogen and a resulting fire with no production of sodium sulfide. Applicant has further endeavored to prepare sodium sulfide by reacting sulfur with sodium amal-

gam in an aqueous solution thus avoiding the violent conditions existing in the sodium-water reaction. No sodium sulfide was produced by this treatment. The reaction involved in the process of applicant is the preparation of water soluble alkali metal polysulfides by a reaction between sulfur and an alkali metal sulfide, followed by the reduction of this water soluble alkali metal polysulfide with the corresponding alkali metal amalgam. The first part of the process, namely the preparation of polysulfide by heating an aqueous solution of a sulfide with sulfur is, of course, well known. Nowhere, however, does Mellor or any other reference known to applicant disclose the reduction of alkali metal polysulfide in aqueous solution by means of an alkali metal amalgam. As cited by the Examiner, Mellor discloses on page 632, Vol. II, the addition of metallic sodium to an absolute alcohol solution of sodium tetrasulfide to produce sodium disulfide, but this is certainly in no way analogous to the process of applicant, first since there is no sulfide produced but rather disulfide, and second since the reaction is conducted in a non-aqueous solution. The other Mellor references show reaction between pure alkali metals and sulfur in the absence of any solvent and it is submitted that these references cannot be looked upon as even remotely suggesting the reduction of alkali metal polysulfides in an aqueous solution by an alkali metal amalgam to form alkali metal sulfides.

The pertinency of the Examiner's reference to Mellor, Vol. IV, pages 1018 and 1019, is not understood. In the Vol. IV of Mellor available to applicant no statement to the effect that sodium amalgam behaves as though it were a solution of sodium in mercury can be found on these two pages. On page 1017, line 20, exactly the opposite statement occurs "According to V. Merz and W. Weith, L. Schuz and G. McP. Smith, the general results show that in all probability amalgams are solutions of compounds of the dissolved metal with certain definite proportions of solvent mercury in an excess of mercury". On page 1013 Mellor gives evidence that such compounds exist such as $NaHg_4$ etc. If the sodium and mercury were to react as individuals, as would be the case if sodium and sodium amalgam were equivalents, we see no explanation for the reaction described elsewhere in Mellor "HgS is made by rubbing mercury and sulfur together in a mortar". The quantity of mercury present is so many times greater than sodium that it would seem reasonable to expect at least some mercuric sulfide to be produced with the sodium sulfide if the reaction mixture were composed merely of a mechanical mixture of mercury, sodium and sulfur. Since no mecuric 116 sulfide is produced in the process of applicant, we cannot agree that under these circumstances sodium amalgam is an obvious equivalent of sodium. While an alkali metal and the corresponding amalgam are similar in certain properties, notably that they are both reducing agents, they are sufficiently different to preclude any predictions as to their reaction on new substances. For example, metallic sodium will react with anhydrous liquid methyl alcohol with almost explosive violence. Sodium amalgam does not react with anhydrous methyl alcohol at all.

It is further submitted that the Examiner's reference to the production of sodium sulfide by reaction of sodium hydroxide with sulfur, as disclosed by Mellor, is not a proper reference, since the process of this application is directed only to the reaction of sodium amalgam with sodium polysulfide to produce sodium sulfide. Further, by the use of sodium hydroxide and sulfur, sodium thiosulfate is also produced in the reaction, and this is not the case in the present instance. In the light of the above discussion it is claimed that the citations from Mellor are not valid references inasmuch as the reactions disclosed by Mellor all involve either entirely different ingredients or else carry out the reaction in different media or under very different circumstances.

The Examiner's remarks concerning the Frazier patent No. 1,614,063 have been carefully considered but the con-

nection between the process of Frazier and that of applicant is not understood. The Frazier patent discloses a method for preparing a sodium polysulfide or "a sodium sulfur compound exceedingly high in polysulfides and low in thiosulfate" in the absence of any solvent. It is
117 submitted that metallic sodium and sodium carbonate cannot rightly be regarded as equivalent reagents, particularly in water solution. Further, Frazier fuses together sodium sulfide, sodium carbonate and sulfur to make a solid sodium polysulfide-sodium thiosulfate-sodium sulfate-free sulfur mixture. Applicant reacts sulfur with sodium sulfide in an aqueous medium and reduces the resulting polysulfide with sodium amalgam also in an aqueous medium.

It is submitted that the Williams et al. patent No. 1,939,839 contains no disclosure which should be held to anticipate the disclosure claimed in the present application. The Examiner has stated that Williams discloses the desulfurizing of oils by mixing with sodium amalgam thereby forming free mercury and sodium sulfide compounds. A careful study of this patent discloses no reference to the formation of sodium sulfide or "sodium sulfide compounds". Williams on page 1, line 47 states "This refining action is due partly to the removal of sulfur compounds and other undesirable substances which form compounds with the alkali metal, and partly to the polymerizing of unstable and therefore undesirable constituents to form gums and resins. These polymerized gums or resins are in part precipitated in the form of sludge together with the alkali metal compounds formed during the process, as mentioned above". This is a clear statement that the sodium reacts with the sulfur compounds in the oil to form sodium organic sulfur compounds but not sodium sulfide. It is accepted that sulfur as it occurs in oils is tied up in complex organic sulfur compounds, the most common type of which is
118 perhaps mercaptans (RSH). The acidic hydrogen of this type of compound may be replaced by metals forming salts such as RSNa. Such salts cannot correctly

be considered as or designated "sulfide compounds". On page 1, line 29, Williams further states that "when metallic sodium was placed in cracked gasoline of foul odor it became coated in the course of days with deposits of gum-like resins and other solid material", further indicating that the product formed is a sodium organic product and in no sense a sulfide. Strictly speaking, from the point of view of nomenclature, such compounds as represented by the formula RSNa might be named alkyl sodium sulfide, but the properties of such compounds are in no way similar to the group of substances correctly called sulfides. Williams patent further on page 1, line 11, states that such alkalis as amides and alcoholates are suitable for his process but they could not be used to reduce sodium polysulfide to sodium sulfide.

Massenet German Patent No. 421,263 likewise deals with the desulfurizing of sulfur-bearing oils. In this process alkali metal or alkali metal amalgam is emulsified in a hydrocarbon which is solid at ordinary temperatures. The alkali metal reacts with the acidic hydrogen in the sulfur-containing hydrocarbon in the same manner as in the Williams process. Here again no compounds which could rightly be called sulfides or sulfide-like are produced.

It is therefore claimed that the Williams and Massenet patents do not anticipate the present application because the reaction involved in these patents is not the same as in the present application. The reaction disclosed in these patents is the replacement of a slightly acidic hydrogen atom in an organic sulfur compound with an alkali metal, whereas in the present application the reaction comprises
reducing sodium polysulfide to sodium sulfide by
119 means of sodium amalgam. Thus it is seen that the
reaction products are of entirely different nature. In addition to this, the process of the present application operates entirely in an aqueous medium whereas the processes of these two references are accomplished in a non-aqueous medium, in fact Massenet specifically directs that if any water is present with the oil it must be removed

prior to the alkali treatment. The Examiner has said "to react any other sulfur compound having sulfur available for combination, such as sodium polysulfides or free sulfur with sodium amalgam in the manner taught by the above references is clearly uninventive". It is not understood exactly what is meant by sulfur available for combination. It would appear that the sulfur of these organic compounds to which an acidic hydrogen is attached is no more "available for combination" than is the sulfur in sulfuric acid which reacts with alkali to form the salt in the same manner that an RSH type compound reacts with an alkali to form a salt of the type RSNa. The reduction of the polysulfide ion to sulfide ion by means of sodium amalgam is certainly not comparable to such reactions.

Claims 2, 3 and 9 have been further rejected as "indefinite" because of the fact that the term "sulfide-like salts" has no definite or recognized meaning. It is agreed that such an expression used alone without any further description would be indefinite and would have an uncertain meaning. However, the Examiner's attention is called to the last paragraph in the specification which reads:

"In the appended claims, the term 'sulphur-like element' is used to embrace the class consisting of sulphur, selenium and tellurium and the terms 'sulphide-like salt' and 'polysulphide-like salt' are used to embrace, respectively, the class consisting of sulphides, selenides and tellurides and the class consisting of the polysulphides, polyselenides and polytellurides." It is submitted that in view of this very clear and limiting definition of the meaning of these terms their use should be permitted in the claims.

It is believed that the claims as amended are now in condition for allowance and favorable action is solicited.

Respectfully submitted,

PENNIE, DAVIS, MARVIN & EDMONDS,
Attorneys for Applicant.

New York, N. Y.
October 2, 1936.

121 Endorsed: Mailed Nov 12 1936

Department of Commerce
United States Patent Office
Washington

Applicant: George L. Cunningham
Ser. No. 62,308
Filed Feb. 4, 1936
For Chemical Manufacture.

Pennie, Davis, Marvin & Edmonds,
165 Broadway,
New York, N. Y.

In response to amendment filed Oct. 3, 1936.

The following claims, found allowable, are suggested for purpose of interference. Applicant should make same by Dec. 16, 1936 under the provisions of Rule 96. Failure to do so will be considered a disclaimer of the subject matter involved:

"The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulphide."

"The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal sulphide and sulphur."

"The process of producing an alkali metal sulphide which comprises reacting an alkali metal amalgam containing a fraction of 1% of the alkali metal with an aqueous solution of the corresponding alkali metal polysulphide."

The rejection of claims 2, 3 and 9 as indefinite in "sulphide-like salt" and like expressions is repeated. Applicant may avail himself of the Ex parte Markush type of claim to cover the salts which he considers to fall in this category, hence no good reason is seen for the use of this indefinite and uncertain expression. The mere fact that applicant indicates in the specification what he means by this term is not sufficient to justify its use where the subject matter can adequately be covered in acceptable and well recognized terminology.

Claims 1 and 8 are rejected as alternative in the substances used to react with the amalgam.

Claims 4, 5, 6, 7, 10 and 11 appear allowable as now advised.

The title should be changed to something more definite.

P. W. SHEPARD,
Examiner.

122 Endorsed: Mail Division Nov. 20 1936 U. S. Patent Office

Endorsed: U. S. Patent Office Nov 21 1936 Division 59

In the United States Patent Office

In re application of
George L. Cunningham
Serial No. 62,308
Filed Feb. 4, 1936
Div. 59 Room 4709

For: Chemical Manufacture

New York, N. Y., November 19, 1938

Honorable Commissioner of Patents,
Washington, D. C.

Sir:

Responsive to the official action of November 12, 1936, please add the following claims:

12. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulphide.

13. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an

aqueous solution of the corresponding alkali metal sulphide and sulphur.

14. The process of producing an alkali metal sulphide which comprises reacting an alkali metal amalgam containing a fraction of 1% of the alkali metal with an aqueous solution of the corresponding alkali metal polysulphide.—

123 *Remarks*

The above presented claims have been added in the above-identified application under the provisions of Rule 96 and in response to the official action of November 12, 1936. These claims are added without prejudice to applicant's rights in the premises in advance of an opportunity to inspect the application in which these particular claims originated.

Respectfully submitted,

PENNIE, DAVIS, MARVIN & EDMONDS,
Attorneys for Applicant.

124 Endorsed: Mailed Jan 7 1937

Department of Commerce
United States Patent Office
Washington

Applicant: George Lewis Cunningham
Ser. No. 62,308
Filed Feb. 4, 1936

For Chemical Manufacture

Pennie, Davis, Marvin & Edmonds,
165 Broadway,
New York, N. Y.

The case, above referred to, is forwarded to the Examiner of Interferences because it is adjudged to interfere with others, hereafter specified. The question of priority will be determined in conformity with the Rules. The interference will be identified as No. 73765. On or before

Mar. 1, 1937 the statement demanded by rule 110 must be sealed up and filed with the subject of invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count 1. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulphide.

Count 2. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal sulphide and sulphur.

Count 3. The process of producing an alkali metal sulphide which comprises reacting an alkali metal amalgam containing a fraction of 1% of the alkali metal with an aqueous solution of the corresponding alkali metal polysulphide.

The interference involves your application above identified and an application for:

Process for Producing Alkali Metal Sulfides, filed by Enzo Lanzetti, of Como, Italy, whose post office address is 4, Via Luciano Manara, Como, Italy, whose attorney is Paul Ferchland, 5, Hewaldstrasse, Berlin—Schoenberg, Germany, and whose assignee is Luigi Achille, Milan, Italy.

The relation of the counts of the interference to the claims of the respective parties is as follows:

Count	Lanzetti	Cunningham
1	12	12
2	13	13
3	14	14

(Counts compared)

125 S.N. 62,308

After termination of the interference this application will be held for restriction and revision under Rule 96.

Claims 1-11 will be held subject to rejection as unpatentable over the issue in the event of an award of priority adverse to applicant.

P. W. SHEPARD,
Examiner, Div. 59.

Pennie, Davis, Marvin & Edmonds,
165 Broadway,
New York, N. Y.

126 *Interference*

Interference No. 73765 Paper No. 9
Name, George Lewis Cunningham
Serial No. 62,308
Title, Chemical Manufacture
Filed Feb. 4, 1936
Interference with Enzo Lanzetti

Decisions on Motion

Ex'r of Interferences, ... Dated............
Board of Appeals, ... Dated............

Decisions on Priority

Ex'r of Interferences Adverse Dated, Apr 29 1938
Board of Appeals, Affirmed Dated, Feb 14/39
Court, ... Dated,..................

Remarks

* * * * * * * * * *

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

127 Endorsed: Mailed June 1 1939

Div. 59 Room 4709 Paper No. 10

Department of Commerce
United States Patent Office
Washington

Applicant: Geo. L. Cunningham
Ser. No. 62,308
Filed Feb. 4, 1936
For Chemical Manufacture

Pennie, Davis, Marvin and Edmonds,
165 Broadway,
New York, N. Y.

Interference No. 73,765 having terminated adversely to applicant claims 12-14 which constituted the issue thereof stand finally rejected. Rule 132.

Claims 1-11 are rejected as obviously unpatentable over the issue of the interference.

The rejections of claims 2, 3 and 9 as indefinite and claims 1 and 8 as alternative as made in the Office action of Nov. 12, 1936 are believed well taken. These rejections are now due for response from applicant.

All claims stand rejected for the reasons given and those outstanding of record.

P. W. SHEPARD,
Examiner.

Submitted May 27 1939 Supervisory Examiner.

128 See notice of Suit under Section 4915 R. S. in U. S. Dist. Court for the District of Columbia.

Suit No. 3309

For original notice of Suit see Interference #73,765.

7/5/39.

129 Endorsed: Application Div. Jul 6 '39 U. S. Patent Office

Endorsed: U. S. Patent Office July 7 1939 Division 59

In the United States Patent Office

In re application of
George L. Cunningham
Serial No. 62,308
Filed February 4, 1936
Div. 59, Room 4709

Chemical Manufacture

Honorable Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the above-identified application it is respectfully requested that the Official Action of June 1, 1939 be withdrawn and further action in the case suspended until priority of invention has been finally adjudicated.

On June 30, 1939 a complaint under R. S. 4915 was filed in the District Court of the United States for the District of Columbia by The Mathieson Alkali Works, Inc., the assignee of record of the above-identified application against Luigi Achille of Milan, Italy, assignee of the application of Enzo Lanzetti, Serial No. 74,592, which, together with the above-identified application, was involved in Interference No. 73,765. The complaint has been assigned Civil Action No. 3309.

It is pointed out that withdrawal of the action of June 1,
1939 and suspension of further action in the case until priority finally is adjudicated in the action under R. S.
130 4915 is in conformance with the practice established
by In re Schweyer, 389 O. G. 787.

Respectfully submitted,

PENNIE, DAVIS, MARVIN & EDMONDS,
Attorneys for Applicant

July 5, 1939

131 Endorsed: Mailed Jul 15 1939

Div. 59 Room 4709 Paper No. 12

Department of Commerce
United States Patent Office

Applicant: Geo. L. Cunningham
Ser. No. 62,308
Filed Feb. 4, 1936
For Chemical Manufacture

Pennie, Davis, Marvin and Edmonds,
165 Broadway,
New York, N. Y.

Responsive to letter of July 6, 1939.

The rejection of claims 12-14 under rule 132 and of claims 1-11 as unpatentable over the issue of interference 73,765, is withdrawn in view of applicant's appeal under R. S. 4915.

Attention is called to the fact that claims 1, 2, 3, 8 and 9 stand under rejection as set forth in a prior Office action, which must be answered without further action by the Office, in the event appellant is successful in his appeal.

Action in this case stands suspended until the determination of appeal by the Court.

P. W. SHEPARD,
Examiner.

Submitted Jul 14 1939 Supervisory Examiner

132 2/4/36

1936

Contents

1. Application........papers.
2. Sheet Prints Feb 8/36.
3. Rejection Apr 17 1936.
4. Supplemental Rejection Apr 29 1936.
5. Amdt. A Oct 3, 1936.

6. Rejection & Ltr. Suggesting clms. Nov 12 1936.
7. Amdt. B Nov 20/36.
8. Intf. Ltr. 73765 Jan 7 1937.
9. Intf. Brf.
10. Rejection Jun 1 1939.
11. Letter July 6, 1939.
12. Action Suspended Jul 15 1939.

PLAINTIFF'S EXHIBIT C

133 Endorsed: Filed Feb 10 1942 Charles E. Stewart, Clerk.

Department of Commerce
United States Patent Office

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the Petition, Specification and Oath, as originally filed, April 15, 1936, Serial Number 74,592, in the matter of the Letters Patent of Enzo Lanzetti, assignor to Luigi Achille, Number 2,227,547, Granted January 7, 1941, for Improvement in Processes for Producing Alkali Metal Sulphides.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this fifth day of March, in the year of our Lord one thousand nine hundred nad forty-one and of the Independence of the United States of America the one hundred and sixty-fifth.

(Seal) CONWAY P. COE,
Commissioner of Patents.

Attest:
D. E. WILSON,
Chief of Division.

134 Endorsed: Mail Division U. S. Patent Office Apr 15 1936

Petition

To the Commissioner of Patents:

Your Petitioner Enzo Lanzetti a citizen of Italy residing at Como, Italy whose post-office address is 4, Via Luciano Manara, Como, Italy prays that Letters Patent be granted to him for the improvement in Process for Producing Alkali Metal Sulfides set forth in the annexed Specification.

And he hereby appoints Paul Ferchland, Reg. Pat. Attorney No. 11765, of 5, Hewaldstrasse, Berlin-Schoeneberg, Germany his attorney, with full power of substitution and revocation, to prosecute this application to sign the drawings, to make alterations and amendments therein, to receive the Patent, and to transact all business in the Patent Office connected therewith.

ENZO LANZETTI

Specification

To all whom it may concern:

Be it known that I, Enzo Lanzetti, a citizen of Italy residing at Como, Italy have invented certain new and useful improvements in Process for Producing Alkali Metal Sulfides of which the following is a specification:

135 This invention relates to the production of alkali metal sulfides by electrolysis.

It is well-known that by electrolyzing aqueous solutions of alkali metal chlorides (NaCl, KCl &c) at the positive electrode (anode) chlorine ions, at the negative electrode (cathode) ions of the respective alkali metals (Na, K &c) are discharged.

Furthermore it is well-known that the anodic products can be separated from the cathodic products by suitable means, whereby reactions occurring between both products are wholly or partially avoided. Finally it is well-known that amalgams of the alkali metals are obtained by carrying out the electrolysis of alkali metal chloride solutions when employing mercury cathodes.

The well-known electrolytic processes for producing alkali metal hydroxides, as well as the well-known reduction and hydrogenizing processes for which alkali metal amalgams are used are based upon the above-mentioned principles.

The present invention relates to a process for producing alkali metal sulfides by electrolyzing alkali metal chlorides and subjecting the cathodic products to the action of sulfur, either in a finely divided or loose form or suspended in a suitable medium, or dissolved in alkali sulfide solutions (whereby polysulfides (Na_2Sx &c) are formed).

Example 1

One of the well-known electrolyzers provided with a porous diaphragm may be employed, the electrolyte being a concentrated solution of common salt. During the electrolysis finely divided sulfur is brought to contact with the electrolyte in the cathodic chamber only. The liquid
136 in the cathodic chamber may be agitated by suitable means. During the operation the addition of the sulfur is controlled in such a way that the total sulfur content (S including Na_2S) in the electrolyte of the cathodic zone is maintained in such a manner that for the electric conductivity substantially the NaCl is decisive. The apparatus may be heated or cooled by suitable means. When continuing the electrolysis Na_2S is formed in the cathodic zone by the combination of the nascent alkali metal with sulfur, for instance, in the form of Na_2S_2. The electrolytic reaction may be represented by the following formula:

$$2\,NaCl + S \longrightarrow Na_2S + Cl_2.$$

It may be assumed that the following secondary reaction takes place:

$$2\,NaCl + 2\,H_2O \longrightarrow 2\,NaOH + Cl_2 + H_2.$$

From the solutions containing sodium sulfide and sodium chloride or in some cases sodium sulfide, sodium chloride and sodium hydroxide, the sodium sulfide may be separated by one of the well-known methods. The process as described may also be carried out continuously by correspondingly controlling the current intensity as well as the supply of the electrolyte and the sulfur.

Example 2

The apparatus used may be an electrolyzer provided with bell or an electrolyzer provided with a liquid diaphragm. The electrolyte may be a concentrated solution of potassium chloride. During the electrolysis the electrolyte is brought in the cathodic zone to contact with K_2S_2 dissolved, for instance, in water. During the operation the addition of
K_2S_2 is controlled in such a way that the total sulfur
137 concentration $(S+K_2S)$ in the electrolyte of the
cathodic zone is kept within such limits, that the KCl
is decisive for the electric conductivity.

The apparatus may be heated or cooled. On continuing the electrolysis of K_2S is obtained in the cathodic zone by the combination of K with K_2S_2.

The electrolytic reaction may be expressed as follows:

$$2\,KCl + K_2S_2 \longrightarrow 2\,K_2S + Cl_2.$$

The following secondary reaction is assumed to take place:

$$2\,KCl + H_2O \longrightarrow 2\,KOH + Cl_2 + H_2.$$

The process may be carried through continuously as in example 1. The potassium sulfide may be separated from the resulting solutions by one of the well-known methods.

Example 3

An electrolytic apparatus of well-known construction having a moving mercury cathode may be employed. The electrolyte may be a concentrated solution of common salt. By the passage of the electric current a sodium amalgam of varying concentration according to the conditions chosen in each single case is formed. The transport of the sodium amalgam from the electrolytic to the reaction zone may be facilitated by stirring or other suitable means. When the amalgam in the reaction zone is brought to contact with the sulfur which may be loose or suspended in a suitable medium, for instance, water, Na_2S is formed by the reaction between the amalgam and the sulfur according to the following formula:

$$2\,HgNa + S \longrightarrow Na_2S + S\,Hg.$$

The following secondary reaction may take place:

$$Hg+S=HgS.$$

138 Furthermore the following reaction might occur:

$$HgNa + H_2O \longrightarrow NaOH + Hg + H.$$

The contact between the amalgam and the sulfur may take place in the state of static equilibrium or may be intensified by stirring. The apparatus may be heated or cooled as required. The sodium sulfide may be separated from the solution or suspension by well-known methods. The process may also be carried through continuously.

Example 4.

The decomposition of the amalgam may be effected in a separate apparatus. The latter may be of different type or shape (tube, channel or chamber) and may consist of metal or other suitable material. It may be provided with agitating means or not, and may further be provided with means for heating or cooling. The amalgam which is introduced into the apparatus continuously or intermittently may be of different concentration, for instance, it may contain 5 grams Na per 1000 grams Hg. The amalgam is brought to contact in the reaction apparatus with an aqueous solution of Na_2S_2, the operation being controlled in such a way that during the contact between Hg and Na_2S_2 also HgNa is continuously present. In other terms the reaction takes place in continuous presence of HgNa, for instance, 0.6 grams of Na being present per 1000 grams of mercury. In this way I may attain that not HgS but Na_2S is formed by the combination of the amalgam with the polysulfide. The reaction may also proceed according to the following formula:

$$HgNa_x + Na_2S_2 \longrightarrow 2\,Na_2S + HgNa_{x-2}$$

The following secondary reaction may occur:

$$HgNa_x + H_2O \longrightarrow NaOH + H + HgNa_{x-1}$$

139 The resulting amalgam may be returned, either immediately or after the remaining sodium has been removed by well-known methods, to circulate again in the electrolytic apparatus.

The process may also be carried out continuously. The sodium sulfide may be separated from the solution by well-known methods.

Example 5

The same apparatus as mentioned sub 4) may be employed. The sodium amalgam is brought to contact in the reaction apparatus, for instance, with an aqueous alcoholic solution of Na_2S_3, care being taken that during the contact between the amalgam and the solution always activated S (Na_2Sx) be continuously present. In this case I may obtain, that not NaOH, but only Na_2S is formed. The reaction may be formulated as follows:

$$2HgNa + Na_2S_x \longrightarrow 2\,Na_2S + Hg + Na_2S_{x-1}$$

As a secondary reaction the formation of HgS may take place according to the well-known formula. The process may be a continuous one.

Example 6

The same apparatus is employed as sub 4). In the reaction apparatus the sodium amalgam comes into contact, for instance, with an aqueous solution of Na_2S_4. The process is conducted in such a way that both the conditions of examples 4 and 5 are realized, i.e. the contact between the amalgam and the Na_2S_4 is accomplished in such a manner that continuously sodium and activated sulfur are present.

140 Furthermore the process is conducted in such a way that during the contact stoechiometric ratios

exist between the amalgam and the Na_2S_4 to obtain a sodium sulfide of greatest purity.

By proceeding in this way the formation of NaOH and HgS may be avoided and a sodium sulfide of excellent purity may be obtained. This process too may be carried out continuously; the sodium sulfide may be separated by crystallization or fused.

I claim:

1. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis and bringing the cathodic products to contact with sulfur.

2. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis and bringing the cathodic products to contact with sulfur dissolved in an alkali metal sulfide solution.

3. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis with a mercury cathode and bringing the resulting alkali metal amalgam to contact with sulfur.

4. Process for producing alkali metal sulfide comprising subjecting alkali metal chloride solutions to electrolysis with a mercury cathode and bringing the resulting alkali metal amalgam to contact with sulfur dissolved in an alkali metal sulfide solution.

5. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis with a mercury cathode and bringing the resulting alkali metal amalgam to contact with sulfur, the presence of alkali metal in the mercury being continuously maintained.

141 6. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis and bringing the cathodic products to continuous contact with sulfur.

7. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis and bringing the cathodic products to continuous contact with sulfur dissolved in an alkali metal sulfide solution.

8. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis with a mercury cathode and bringing the resulting alkali metal amalgam to contact with sulfur, the presence of sulfur being continuously maintained.

9. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis with a mercury cathode and bringing the resulting alkali metal amalgam to contact with sulfur, the alkali metal in the mercury and the sulfur being kept throughout the reaction in stoechiometric proportions.

10. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis with a mercury cathode and bringing the resulting alkali metal amalgam to contact with sulfur dissolved in an alkali metal sulfide solution, the presence of the dissolved sulfur being continuously maintained.

11. Process for producing alkali metal sulfides comprising subjecting alkali metal chloride solutions to electrolysis with a mercury cathode and bringing the resulting
142 alkali metal amalgam to contact with sulfur dissolved in an alkali metal sulfide solution, a stoechiometric ratio being maintained throughout the reaction between the alkali in the mercury and the dissolved sulfur.

143 In Testimony Whereof I affix my signature.

ENZO LANZETTI

Affirmation

Kingdom of Italy, City of Milan,
Consulate of the United States of America, ss:

Enzo Lanzetti, the above-named petitioner, being duly affirmed, deposes and says that he is a citizen of Italy and resident of Como, Italy, that he verily believes himself to be the original, first and sole inventor of the improvement in Process for Producing Alkali Metal Sulfides described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application; or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by him or his representatives or assigns in any country foreign to the United States, except as follows: Italy, filed June 15, 1935; Germany, filed July 29, 1935; with affiant's knowledge and consent in the name of Luigi Achille, Milano, Italy.

ENZO LANZETTI

Affirmed to and subscribed before me this 28th day of March, 1936.

FRANK NICCOL,

Vice Consul of the United States
of America.

PLAINTIFF'S EXHIBIT D

144 Endorsed: Filed Feb 10 1942 Charles E. Stewart, Clerk.

Endorsed: Docket Division Nov 30 1937 U. S. Patent Office.

IN THE UNITED STATES PATENT OFFICE.

BEFORE THE EXAMINER OF INTERFERENCES.

Interference No. 73,765.

GEORGE L. CUNNINGHAM

vs.

ENZO LANZETTI.

Testimony for Cunningham.

Pennie, Davis, Marvin & Edmonds, Attorneys for Cunningham. Raymond F. Adams, of Counsel.

* * * * * * * * * *

149 *Declaration of Interference.*

Department of Commerce
United States Patent Office
Washington

(Mailed Jan. 7, 1937)

Pennie, Davis, Marvin & Edmonds,
165 Broadway,
New York, N. Y.

Applicant: G. L. Cunningham
Ser. No. 62,308
Filed Feb. 4, 1936
For Chemical Manufacture

D3844.1

The case, above referred to, is forwarded to the Examiner of Interferencces because it is adjudged to interfere with others hereafter specified. The question of priority will be determined in conformity with the Rules. The interference will be identified as No. 73,765. On or before March 1, 1937, the statement demanded by Rule 110 must be sealed up and filed with the subject of invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count 1. The process of producing alkali metal sulphides which comprises reacting an alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulphide.

Count 2. The process of producing alkali metal sulphides amalgam containing a fraction of 1% of the alkali metal with an aqueous solution of the corresponding alkali metal polysulphide.

150 Count 3. The process of producing an alkali metal sulphide which comprises reacting an alkali metal amalgam containing a fraction of 1% of the alkali metal with an aqueous solution of the corresponding alkali metal polysulphide.

The interference involves your application above identified and an application for:

Process for Producing Alkali Metal Sulfides, filed by Enzo Lanzetti, of Como, Italy, whose post office address is 4, Via Luciano Manara, Como, Italy, whose attorney is Paul Ferchland, 5, Hewaldstrasse, Berlin, Schoeneberg, Germany, and whose assignee is Luigi Achille, Milan, Italy.

The relation of the counts of the interference to the claims of the respective parties is as follows:

Count	Lanzetti	Cunningham
1	12	12
2	13	13
3	14	14

(Counts compared)

After termination of the interference this application will be held for restriction and revision under Rule 96.

Claims 1-11 will be held subject to rejection as unpatentable over the issue in the event of an award of priority adverse to applicant.

Examiner, Div. 59.

Pennie, Davis, Marvin & Edmonds,
165 Broadway,
New York, N. Y.

151 *Preliminary Statement of George L. Cunningham.*

IN THE UNITED STATES PATENT OFFICE.

BEFORE THE EXAMINER OF INTERFERENCES.

Interference No. 73,765.

GEORGE L. CUNNINGHAM

vs.

ENZO LANZETTI.

State of New York,
County of Niagara, ss:

George L. Cunningham, being duly sworn, deposes and says:

That he is the applicant whose application for "Chemical Manufacture", Serial No. 62,308, filed February 4, 1936, is involved in an interference with an application of Enzo Lanzetti for "Process for Producing Alkali Metal Sulfides", which interference was declared January 7, 1937 and is identified as Interference No. 73,765;

That he made a written description of the invention defined by the counts set forth in the declaration of interference on August 22, 1934, but that, the invention being a process, he made no drawing of the invention;

That he disclosed the invention to others during the month of December, 1934, in a monthly progress report for December, 1934;

That the acts which establish conception of the invention are comprehended by deponent's successful reduction 152 to practice on August 22, 1934, which successful reduction to practice was described in a written description made August 22, 1934, in deponent's laboratory notebook No. 15, said written description appearing on pages 69 and 70 and comprising a description of an operation as carried out by deponent and a description of the reaction involved;

That he reduced the invention to practice on August 22, 1934 and again on a larger scale on December 11, 1934;

That he began actively exercising diligence with respect to the invention on August 22, 1934; and

That no application for the same invention was filed by him or on his behalf in any foreign country before February 4, 1936.

GEORGE LEWIS CUNNINGHAM.

Subscribed and sworn to before me this 25th day of February, 1937.

H. H. Hackenheimer,
(Seal) *Notary Public, Niagara County.*

My commission expires March 30, 1937.

IN THE UNITED STATES PATENT OFFICE.

Before the Examiner of Interferences.

Interference No. 73,765.

George L. Cunningham

vs.

Enzo Lanzetti.

Messrs. Richards & Geier,
274 Madison Square,
New York, New York.

Sirs:

Please take notice that on Thursday, November 4th, 1937, at 10:00 A. M., before Myrtice Mault, as Notary Public, or other competent Notary Public, at the offices of Pennie, Davis, Marvin & Edmonds, 165 Broadway, New York, New York, we shall proceed to take the testimony of:

George L. Cunningham, 735 Fourth Street, Niagara Falls, New York.

Maurice C. Taylor, 3040 Delancey Road, Niagara Falls, New York.

154 Robert B. Wittenberg, 57 Perth Avenue, New Rochelle, New York,

and of

Ralph E. Gage, Whippoorwill Road, Armonk, New York, and possibly others of whom due notice will be given. You are invited to attend and cross-examine.

Very truly yours,

(Sgd.) PENNIE, DAVIS, MARVIN & EDMONDS,
Attorneys for Cunningham.

Service of the above notice is hereby acknowledged this 28th day of October, 1937.

(Sgd.) RICHARDS & GEIER,
Attorneys for Lanzetti.

155 *Stipulation*

IN THE UNITED STATES PATENT OFFICE.

Before the Examiner of Interferences.

Interference No. 73,765.

George L. Cunningham
vs.
Enzo Lanzetti.

It is hereby stipulated that testimony in the above-entitled interference may be taken down stenographically and transcribed.

(Sgd.) PENNIE, DAVIS, MARVIN & EDMONDS,
Attorneys for Cunningham.

(Sgd.) RICHARDS & GEIER,
Attorneys for Lanzetti.

Dated at New York, New York, this 4th day of November, 1937.

IN THE UNITED STATES PATENT OFFICE.

Before the Examiner of Interferences.

Interference No. 73,765.

George L. Cunningham

vs.

Enzo Lanzetti.

Testimony in behalf of the party George L. Cunningham, pursuant to the annexed notice, before Myrtice S. Mault, Notary Public, in the offices of Pennie, Davis, Marvin & Edmonds, 165 Broadway, New York, New York, beginning at 10:00 A. M., Thursday, November 4, 1937.

Present:

Raymond F. Adams, of Pennie, Davis, Marvin & Edmonds, as counsel for George L. Cunningham.

George L. Cunningham, a witness in his own behalf, being first duly sworn, deposes and says, in answer to questions propounded by Mr. Raymond F. Adams, as follows:

Q. 1. Please state your name, age and residence? A. George Lewis Cunningham, 32 years old, 735 Fourth Street, Niagara Falls, New York.

Q. 2. What is your principal occupation? A. Research chemist with Matheison Alkali Works.

157 Q. 3. How long have you been employed by Mathieson? A. Since June, 1930.

Q. 4. Are you the George Lewis Cunningham whose application, filed February 4, 1936, Serial No. 62,308, is involved in Interference No. 73,765? A. Yes, sir, I am.

Q. 5. I wish you would tell us the general subject matter of your work for The Mathieson Alkali Works, in the middle of the year 1934? A. Along in June, 1934, I was requested by the Research Department of The Mathieson Alkali Works to consider the possibility of producing a hydrogen sulfide to use in our ammonia soda operations at Saltville, Virginia. In connection with this work it soon became apparent that sodium sulfide would be just as acceptable as hydrogen sulfide. I immediately proceeded to investigate various methods of producing sodium sulfide. In the course of this exploratory work I considered the possibility of producing sodium sulfide using sodium amalgam. I first tried in July, 1934, to react flowers of sulfur stirred in water with sodium amalgam. Due to the low solubility of sulfur in water, little or no reaction occurred, and as a result I considered that this would not be an economical way of producing sodium sulfide. I then attempted to dissolve the sulfur in various solvents such as carbon tetrachloride and carbon disulfide. The reaction was obtained, always however accompanied by side reactions such as the production of sodium chloride, sodium thiosulfite and other impurities. At this time I hit upon the general idea of dissolving the sulfur in sodium sulfide solution. I found that this gave a fast reaction with a practically complete discharge of the sodium amalgam.

Q. 6. Did you make any record of that work of which you have just spoken? A. Yes, sir, I did. I made a record of that work in our regular Research Department red notebooks.

158 Q. 7. (Handing book to witness.) Is this notebook I hand you the place where you made that record? A. Yes, sir, it is. It is my red notebook #15, marked on page 43, dated July 28, 1934.

Q. 8. Are the entries on this page in your handwriting? A. I made the entries. Yes, sir, they are.

Q. 9. And when did you make them? A. I made the entries on July 20, 1934.

Mr. Adams: I offer this page 43 of Notebook #15, dated July 20, 1934, as Cunningham Exhibit No. 1.

(The exhibit was so marked by the notary.)

Q. 10. Did you report this work to anyone else in The Mathieson Alkali Works? A. Yes, sir, I did. In my July monthly report of 1934 I reported this work and sent copies of this report to Mr. Gage, Mr. Taylor, Mr. Hultz and Mr. MacMullin and Colonel Vaughn.

Q. 11. Who was Mr. Gage? A. Mr. Gage is the Director of Research of The Mathieson Alkali Works.

Q. 12. And who is Mr. Taylor? A. Mr. Taylor is Assistant Director of Research of The Mathieson Alkali Works.

Q. 13. I show you a paper headed "Research Exploration" and marked in the next line, "Progress Report for July, 1934". Is this the report to which you just referred (showing witness)? A. Yes, sir.

Q. 14. Is this your signature at the bottom of the sheet? A. Yes, sir, it is.

Q. 15. And when did you say you prepared that report? A. I prepared that report early in the month of August, within the following week after the last of July.

Mr. Adams: I offer this progress report for July, 1934, as Cunningham Exhibit 2.

(Received and so marked by notary.)

159 Q. 16. Now, I wish you would tell us what you next did in this matter of producing alkali metal sulfides from alkali metal amalgams? A. In August, 1934, I carried out the process for producing alkali metal sulfides which comprised reacting alkali metal amalgam with an aqueous solution of the corresponding alkali metal polysulfied.

Q. 17. I wish you would tell us how you prepared the solution of the alkali metal polysulfide? A. I dissolved sodium sulfide in water and added flowers of sulfur to the sodium sulfide solution. The sulfur dissolved in this solution to form sodium polysulfide.

Q. 18. Is there any easy way of distinguishing the sodium polysulfide solution from the sulfide solution? A. Yes, sir, there is. Visually and colorometrically. The polysulfide solutions are colored a deep red. The sodium sulfide solutions are practically colorless.

Q. 19. So that as the sulfur dissolved in the sodium sulfide solution you would get a deeper and deeper red color? A. Yes, sir. Always in direct proportion to the amount of polysulfide.

Q. 20. Where did you get the alkali metal amalgam which you used? A. The alkali metal amalgam was prepared by plunging small particles of metallic sodium upon the surface of liquid mercury.

Q. 21. The sodium would dissolve in the mercury? A. The sodium would dissolve to form a solution of sodium and mercury.

Q. 22. Can you give us any idea as to what proportion of sodium there was in amalgam? A. Proportion of sodium in amalgam was usually 0.1% by weight.

Q. 23. How did you react the amalgam with the polysulfide solution? A. I placed the mercury in a 500 cc. Erlenmayer flask. The sodium polysulfide solution was added on top of the amalgam.

160 Q. 24. Well, the metallic sodium was dissolved sodium amalgam when you added it to the flask? A. Yes, it was. The sodium was dissolved in the form of amalgam.

Q. 25. Go ahead and tell us what you did? A. After the polysulfide solution was added to the amalgam a rather vigorous reaction began. The solution became much warmer than it was and the red color of the polysulfide solution was discharged giving practically a colorless solution.

Q. 26. Well, now you told us that this aqueous solution as added to the amalgam originally contained some sodium sulfide. What happened to the sodium sulfide content of this solution as the result of the reaction just described? A. The amount of sodium sulfide in solution was very greatly increased. At the end of this reaction I analyzed the colorless solution for sodium sulfide.

Q. 27. What was the source of the sodium and the sulfur in this additional quantity of sodium sulfide? A. The sodium came from the amalgam and the sulfur came from the polysulfide solution.

Q. 28. Did you make any written record of that work at the time? A. Yes, sir, I did. In my regular research notebook.

Q. 29. Is that this same notebook that you spoke about before? A. Yes, sir. It is notebook #15, on page 69 and on page 71.

Q. 30. Are the entries of that notebook in your handwriting? A. Yes, sir, they are.

Q. 31. And you made them when? A. I made those entries on August 22, 1934, and August 23, 1934.

Q. 32. I notice just about the middle of page 69 a heading reading "Analysis of Yellow Liquid" and also near the top of page 71 I notice the same heading "Analysis of Yellow Liquid". Will you please tell us what these entries
mean? A. After the work of August 22nd was per-
161 formed I repeated that same identical experiment on
August 23, 1934. The data given on page 69 refers to the solution prepared on August 22, 1934. The data given on page 71 is an analysis of the solution prepared on August 23, 1934.

Q. 33. Do these analyses that you reported here show the production of sodium sulfide by the reaction? A. Yes, sir. They do. On page 71 the iodine titration and the acid titration showed that the solution contained almost equal amounts of equivalents of sodium and sulfide ions. The acid titration was not accompanied by cloudiness of the solution. This indicates that excess sulfur was not contained in the solution.

Q. 34. And that in turn indicates that the excess sulfur added as polysulfide had been converted to sodium sulfide? A. Yes, sir, it does. In addition to this the discharge of the color in both cases further confirms the fact that the polysulfide was reduced to sodium sulfide.

Q. 35. Is there any significant difference between the operation reported on page 69 and that on page 71? A. No, sir, there is no significant difference.

Q. 36. That is, the second operation is a confirmation of the first. A. Yes, sir, it is.

Mr. Adams: I offer page 69, dated August 22, 1934 from this notebook as Cunningham Exhibit 3, and I offer page 71 from this notebook, dated August 23, 1934, as Cunningham Exhibit 4.

(The exhibits received and marked by notary.)

Q. 37. Now the two operations you just described, you carried out the reaction between sodium amalgam and an aqueous solution of sodium polysulfide? A. Yes.

162 Q. 38. Now I wish you would tell us what you next did with this general type of operation? A. In December, 1934, I carried out experiments on a process for producing sodium sulfide which comprised reacting sodium amalgam with an equeous solution of the corresponding sodium sulfide and sulfur.

Q. 39. That is, in this December work you brought the amalgam into contact with the aqueous solution of sodium sulfide in the presence of sulfur instead of separately preparing the polysulfide solution as you did in the August work? A. Yes, sir.

Q. 40. I wish you would go ahead and tell us just what you did in carrying out this reaction? A. In December I used 8,000 grams of mercury. In this 8,000 grams of mercury I put enough sodium to give a concentration of 0.1% by weight. This amalgam was continuously added to a vessel so arranged that the discharged amalgam could be run off through a small stopcock. The sodium sulfide solution was added to the top of this sodium amalgam. Sulfur was then added to the sodium sulfide solution. As the sulfur dissolved, the solution became red and the reaction with the amalgam started. The solution became quite warm. The sulfur finally dissolved in the sodium sulfide solution and after a few minutes the red color was discharged giving a light yellow solution.

Q. 41. And that light yellow solution was a solution of what? A. That light yellow solution was a solution of sodium sulfide containing a very small amount of sodium polysulfide.

Q. 42. Most of the sulfur that had been added had been converted to sodium sulfide? A. Yes, sir. Practically all of it.

Q. 43. Did you make any record of that December work at the time? A. Yes, sir, I did. I made a record in the regular research laboratory notebook.

163 Q. 44. And was that in the same notebook that you have referred to before or a different one? A. No, sir, this is in a different book—notebook #16, page 26, December 11, 1934.

Q. 45. Those entries are in your handwriting? A. Yes, sir.

Q. 46. And you made them on that date? A. Yes, sir, I did.

Mr. Adams: I offer page 26, dated December 11, 1934, of this notebook #16 as Cunningham Exhibit 5.

(The exhibit received and so marked by the notary.)

Q. 47. Is a sodium amalgam containing 0.1% a liquid? A. Yes, sir. Containing 0.1% it is liquid at the temperatures involved in this case.

Q. 48. What happens as you increase the concentration of the sodium, or if you were using some other alkali metal in an amalgam of mercury? A. As the amalgam sodium is increased, the amalgam first becomes pasty and then later becomes solid. That is, as the sodium concentration is increased, the amalgam becomes solid.

Q. 49. Can you say about where the amalgam ceases to become liquid with respect to sodium concentration. I am referring now to the temperatures at which you were working in these experiments? A. About 1.0% it becomes pasty.

Q. 50. Can you give a corresponding figure for potassium as a corresponding alkali metal? A. Potassium will be slightly more liquid. The place where it is completely liquid and where it is a certain per cent. of solids is a little bit difficult to determine. I would say about 1.5% of potassium.

Q. 51. Did you make any report of this further work with
this production of sodium sulfide from sodium amal-
164 gam with either polysulfide or sulfur? A. Yes, sir,
I did. In my December monthly report for 1934 I reported this possibility and mailed the report to my superiors in the company.

Q. 52. Did Mr. Gage get a copy of the report? A. Yes, sir, Mr. Gage and Mr. Taylor both received copies of this report.

Q. 53. Is this document I hand you the report to which you have just referred? A. Yes, sir, it is.

Q. 54. This is you signature at the end of the report? A. Yes, sir, it is.

Q. 55. And you prepared the report when? A. I prepared the report within the week after the last of December.

Q. 56. That is, this report was prepared during the week of January, 1935? A. Yes, sir. January, 1935.

Mr. Adams: I offer this progress report for December, 1934, as Cunningham Exhibit 6.

(Exhibit marked by notary.)

Q. 57. The part of this report which refers to this production of sulfides from sodium amalgam appears under the heading "Sodium Amalgam" and under the heading "Sulfides" on the second page? A. Yes, sir, it does.

Q. 58. Now, in this December operation that you told us about, you there produced sodium sulfide by reaction between sodium amalgam and an equeous solution of sodium sulfide to which you added sulfur? A. Yes, sir.

Q. 59. So that by the end of 1934 you had succeeded in producing sodium sulfide both by reaction between sodium amalgam and sodium polysulfide in aqueous solution and by reaction between the sodium amalgam and an aqueous solution of sodium sulfide containing sulfur? A. Yes, sir. I had.

165 Q. 60. And you had reported that work to your
superiors, including Mr. Gage and Mr. Taylor by the

first part of 1935? A. Yes, sir. In my July-December monthly reports.

Q. 61. Now, I wish you would tell us what you did in connection with the production of sulfides from amalgams in the first part of 1935? A. In March and April I carried out other experiments on the production of sodium sulfide. This work was concerned with stopping the simultaneous production of small amounts of mercury sulfide. Mercury sulfide was produced in certain cases in rather small amounts. The mercury sulfide occurring in small quantities is soluble in sodium sulfide, probably as Na_2HgS. On dilution of a sodium sulfide solution containing mercury sulfide, the mercury sulfide is precipitated. In March and April attempts were made to determine how to prevent formation of mercury sulfide. I again carried out experiments using sodium amalgam prepared by putting metallic sodium in mercury.

Q. 62. You make a sodium amalgam? A. Yes. Sodium amalgam. This sodium amalgam was reacted with sodium polysulfide solutions in an attempt to discover what conditions were causing the side reaction to form mercury sulfide to occur.

Q. 63. Did this work during March and April enable you to control this formation of mercury sulfide in the process? A. Yes, sir. By keeping a small concentration of sodium in the amalgam, the formation of mercury sulfide could be prevented. In case the amalgam was momentarily discharged, and a small amount of mercury sulfide was produced, it was found that the mercury sulfide could be removed from the sodium sulfide solution by bringing the contaminated sodium sulfide solution in contact with fresh sodium amalgam. The mercury sulfide would be discharged.

Q. 63. Did you make any record of this further
166 work with the process? A. Yes, sir. I did. In my
red notebook #16, page 73, on March 17, 1934, I reported the experiment which I have just discussed. The experiment was described.

Q. 64. I notice that you just gave the date as March 12, 1934. Is that date correct? A. March 17, 1934.

Q. 65. I thought we were talking about the year 1935, when we were speaking just now. I notice that the entry on the page is 1934—is that correct? A. That must be a mistake. It must be 1935. It was in 1935 when the work was done.

Q. 66. That is, the date which appears on page 73 should be March 17, 1935? A. March 17, 1935.

Q. 67. And March 17, 1935, is the date on which you actually made this record? A. Yes, sir.

Q. 68. And this is in your handwriting? A. Yes, sir.

Q. 69. I wish you could refer to other pages in this same notebook and see if you can find further references to this work, beginning with page 91. A. Beginning on page 91, on April 22, 1935, I reported experiment No. 1367. This experiment also was concerned with the discharge of mercury sulfide from the sodium sulfide solution. At this time I was also concerned with the purity of the sodium sulfide solution produced in this way. On page 93 of this same notebook I give an analysis of the solution prepared in experiment No. 1367. This analysis shows that the solution contains sodium sulfide and only small quantities of sodium thiosulfate and sodium sulfite. On page 95, experiment No. 1368, I repeated experiment No. 1367 except that I investigated operating at 40° C. rather than 60° C. as in experiment No. 1360. The change of temperature was to determine if lower temperatures would prevent the formation of mercury sulfide even when the sodium sulfide was discharged.

167 Q. 70. You mean the sodium amalgam? A. The sodium amalgam was discharged. The results show that a lower temperature of 40° C. will not prevent the formation of mercury sulfide, provided the sodium amalgam is discharged. On page 96 of this notebook #16, I give analysis of this solution of sodium sulfide prepared by reacting sodium amalgam with sodium polysulfide. This analysis shows that the solution contains sodium sulfide, a

small amount of sodium thiosulfate and sodium hydroxide.

Q. 71. The sodium sulfide content is this figure 98.65%? A. Yes, sir. On a dry basis.

Q. 72. The entries on these pages 91, 93, 95 and 96 are in your handwriting? A. Yes, sir.

Q. 73. And they were all made during April of 1935? A. Yes, sir. They were.

Mr. Adams: I offer page 73 of this notebook #16 as Cunningham Exhibit 7, and I offer pages 91, 93, 95 and 96 of this same notebook #16 as, collectively, Cunningham Exhibit 8. I suggest that they be marked serially 8a, 8b, 8c and 8d.

(Exhibits received and so marked by notary.)

Q. 74. Did you make any report of this further work? A. Yes, sir, I did. In my monthly report for April I reported this work again to Mr. Gage and Mr. Taylor and others in The Mathieson Alkali Works.

Q. 75. Is this document I hand you the report to which you refer? A. Yes, sir, it is.

Q. 76. And when did you prepare this report? A. I believe I prepared it in the first of June. The report is the report for April and May.

Q. 77. Now, which part of this report is the part that refers to the production of sodium sulfide from sodium
amalgam? A. On the bottom of the first page under
168 the general heading "Chemical Chlorine"—the paragraph following.

Q. 78. What is the significance of this heading "Chemical Chlorine" with respect to this process? A. For some time The Mathieson Alkali Works has been interested in providing a better balanced use of their alkali and chlorine made in their electrolytic cells. Any use for alkalies and the sodium in the amalgam produced in our electrolytic cells will have the general effect as if chlorine was prepared without the simultaneous production of alkalies and in this way a better balance of our production will be obtained.

Q. 79. That is, this process for the production of sodium sulfide from sodium amalgam was described under the heading "Chemical Chlorine" because in your overall plant practice it enabled you to produce chlorine without producing the corresponding equivalent of sodium hydroxide? A. Yes, sir, it did.

Q. 80. And the way you avoided that by this process was by converting the sodium in the amalgam to sodium sulfide instead of sodium hydroxide. A. Yes, sir. That is right.

Q. 81. And in this electrolytic cell to which you referred, as producing chlorine and sodium amalgam, what is the material that is electrolyzed? A. Sodium chloride. Sodium chloride is electrolyzed to form from an aqueous solution chlorine gas and sodium amalgam. Ordinarily the sodium amalgam is then discharged against water to prepare an aqueous solution of sodium hydroxide. This process would change the operation so as to discharge a sodium amalgam produced against an aqueous solution of sodium polysulfide to produce sodium sulfide.

Q. 82. Then, the overall result of your sodium sulfide process used in this connection would be to produce sodium sulfide from sodium chloride and sulfur? A. Yes,
169 sir. You produce sodium sulfide and chlorine from
sodium chloride and sulfur instead of sodium hydroxide and chlorine from sodium chloride and water.

Mr. Adams: I offer this progress report covering the April, 1935 work to which the witness has just previously referred as Cunningham Exhibit 9.

(The exhibit was so marked.)

Q. 83. I am handing you a document of several pages entitled "Summary of Research on Uses for Alkali and for Sodium Amalgam" and will ask you to tell us what it is, if you know? A. This is a summary prepared by Mr. M. C. Taylor, signed June 11, 1935, of uses for alkali and sodium amalgam.

Q. 84. Was a copy of that summary delivered to you? A. During the time of the preparation of this material. I was familiar with it and I saw a copy of this report. I am not sure at the moment whether I retained a copy in my files or not.

Q. 85. But you worked with Mr. Taylor on the preparation of the summary? A. Yes, sir. I worked with Mr. Taylor as a matter of fact all through this work: I was consulting with Mr. Taylor from time to time on various features of the use of sodium amalgam to produce sodium sulfide and other compounds of a similar nature. In this report he reports on various compounds that might be made from amalgam and sodium alkalies in a manner quite similar to sodium sulfide. Sodium sulfide is also reported. On page 4 of this summary is given some preliminary cost calculations on the production of this sulfide from amalgam and sulfur and they are also compared with cost calculations producing sodium sulfide from sodium sulfate and carbon which is the method now used to produce
170 sodium sulfide.

Q. 86. When you say the method now used you mean the method that was in general use at that time? A. Yes, sir. One of the methods.

Q. 87. And you consulted with Mr. Taylor in the preparation of this part of this report before it was finally put together? A. Yes, sir. I had during that period and just previous to that period had prepared some cost calculations of my own made for my own use in determining the value of this process.

Mr. Adams: I will ask to have this Summary of Research on Uses for Alkali and for Sodium Amalgam, dated June 11, 1935, to which the witness has just referred, marked for identification Cunningham Exhibit 10.

(Marked Cunningham Exhibit 10 for identification.)

Q. 88. The part of this which refers more particularly to the process for producing sodium sulfide from sodium amalgam appears on page 4 under the item numbered "2" and under the caption "Sodium Sulfide". A. Yes, sir, it does.

Q. 89. It is all the rest of that item down to the item numbered "3"? A. Yes, sir.

Q. 90. I hand you another document and ask you to tell us what that is, if you know? A. This is a copy of my monthly progress report for June, 1935, which was sent to Mr. Taylor. The first paragraph under the general heading "Sodium Amalgam" refers to a literature search which I had been making on products that probably could be made from sodium amalgam. The second paragraph referred to rough cost estimates which I had made
171 and was not the one that Mr. Taylor had made.

Q. 91. That is, those are the cost estimates on sodium sulfide from the sodium amalgam process to which you have just referred? A. Yes, sir.

Q. 92. Is this your signature at the end of that report? A. Yes, sir, it is.

Q. 93. And when did you prepare this report? A. I prepared it the first week of July, 1935.

Mr. Adams: I offer this progress report for June, 1935, as Cunningham Exhibit 11.

(Exhibit so marked.)

Q. 94. I hand you what appears to be a letter from Mr. Taylor to Mr. MacMullin, dated August 17, 1935, and I will ask you to tell us whether or not you ever got a copy of that letter? A. Yes, sir, I received a copy of this letter some time shortly after August the 25th. While this letter is dated August 17th, I did not receive it immediately because I was on my vacation at the time. This letter was handed to me when I returned the latter part of August, 1935.

Q. 95. Now, will you explain the significance of the letter to us with respect to the work on the sodium sulfide from sodium amalgam process? A. The significance of this letter is that we at that time had reached the place in the development of the sodium sulfide process whereby we would do much more intensive work on it than we had in the past. And as a result of this letter I did start a much enlarged amount of work—a much greater amount of work.

Q. 96. And you were guided by this letter in your further work on the process? A. Yes, sir, I was.

172 Mr. Adams: I will ask to have this letter dated August 17, 1935, marked for identification as Cunningham Exhibit 12.

(So marked.)

Q. 97. Now I believe you just told us that following this, your receipt of a copy of this letter dated August 17, 1935, you continued work on this sodium sulfide from sodium amalgam process on a somewhat enlarged scale? A. Yes, sir.

Q. 98. Did you make any record of this further work? A. Yes, sir. I did. In a notebook at the time I designed some new apparatus for carrying out this work on a much enlarged scale. Instead of preparing the amalgam by plunging small pieces of sodium into liquid mercury, I set up electrolytic cells for preparing the sodium amalgam. In addition to the electrolytic cell at the same time I designed a pumping device for pumping uniform and regulated quantities of mercury. At the same time I also considered the problem of the flow of amalgam, the problem of how to obtain better contact between sodium amalgam and the unreacted sodium polysulfide. I also considered the possibility of preparing sodium sulfide solutions in sufficient concentration to enable sodium sulfide, as a 9-hydrate, to be prepared without evaporation of the sodium sulfide solution.

Q. 99. I wish you would refer us to the pages in your notebook that refer to this work? A. On page 171 of my red research notebook #16, dated August 28, 1935. On page 170 a drawing of one type of discharge apparatus is shown. On page 172 is given an analysis of the sodium sulfide solution prepared in experiment No. 1404 given on page 171. This analysis shows that the solution of sodium

sulfide had reached a concentration of 21.16% sodium sulfide. On page 175 an experiment is given in which the
173 concentration of sodium sulfide reached 5.16 mols per
liter. On page 176 is given a crude drawing of the electrolytic cell used to produce sodium amalgam, the glass spiral which was used as a mercury lift or pump and also the discharge apparatus which was used in experiment No. 1407. On page 177, dated September 15, 1935, is given an account of a run in the apparatus pictured on page 176. In this experiment I was attempting to obtain rates of reaction. The reducer as pictured on page 176 was a round vessel 4 inches in diameter. The results on page 177 show that a current of 60 amperes when placed on the electrolytic cell produces sodium amalgam at a rate slightly faster than the discharge tube will discharge. On page 179, experiment No. 1408, dated September 18, 1935, a similar run was made to experiment No. 1407, except that in this case the temperature of the reducer was maintained at 40° C.-50° C. In the previous work I had noticed that increased temperature of the reducer very greatly increased the rate of discharge of the sodium amalgam against the sodium polysulfide solution. The results given on page 179 show that when the reducer is maintained at 40°-50° C. that 60 amperes still produces more sodium amalgam than the discharge vessel can discharge.

Q. 100. I hand you two other documents and ask you to tell us whether or not those are progress reports covering this work in the same manner as the progress report you have previously described. A. Yes, sir. The first paper is a progress report for July and August, 1935. The paragraphs listed under the general heading "Sodium Sulfide" and the second paper is my progress report for September, 1935. The four paragraphs under the general heading "Sodium Sulfide" refer to the work just described.

174 Q. 101. To go back to this notebook #16. All of
the entries on pages 170, 171, 172 and 173 were made by you? A. Yes, sir, they were.

Q. 102. And can you say when they were made? A. They were made on August 28, 1935. They were all made on that date.

Mr. Adams: I offer these four pages, 170, 171, 172 and 173 of this notebook #16 as Cunningham Exhibit 13 and ask that they be marked serially a, b, c and d.

(Received and marked by notary.)

Q. 103. This progress report for July and August, 1935, to which you have referred, has your signature at the bottom? A. Yes, sir, it has.

Q. 104. And that was prepared when? A. That was prepared the first week in September, 1935.

Mr. Adams: I offer this progress report for July and August, 1935, as Cunningham Exhibit 14.

Q. 105. And in notebook #16 I believe you also referred to pages 175, 179? A. Yes, sir.

Q. 106. The entries on the pages were made by you? A. Yes, sir.

Q. 107. And can you say when they were made? A. The entries on pages 176 and 177 were made on September 15, 1935, and the entry on page 179, September 18, 1935.

Q. 108. Can you date the entries on page 175? A. I cannot definitely date those but they must have been made a day or two before September 15, 1935.

Q. 109. They certainly preceded September 15, 1935? A. Yes, sir, preceded that.

175 Mr. Adams: I offer pages 175, 176, 177 and 179 of this notebook #16 as Cunningham Exhibit 15 and will ask that they be marked serially a, b, c and d.

(Received and marked.)

Q. 110. We were right at the end of this notebook #16, these last references to it. I wish you would refer to the next notebook in the series—that will be #17—and tell us whether any more of this work at this same time was reported in that book? A. Yes, sir. On page 1 of notebook

#17 appears the continuation of this work, dated September 28, 1935, experiment No. 1409. In this experiment I used a glass spiral as a discharge tube in an attempt to get a better contact between the sodium amalgam and the sodium polysulfide solution. On page 3 is given a continuation of experiment No. 1409 and also values showing the amount of sodium discharged per minute per square inch of amalgam surface. On page 5 of notebook #17 is given experiment No. 1410. A wooden trough—maple—2 inches wide and 30 inches long was used as a discharge cell. A value of the amount in grams of sodium discharged per square inch per minute is also given. Beginning with the use of the wooden cell the rate was much lower than before for some reason then unknown.

Q. 111. The entries on pages 1, 3 and 5 of notebook #17 are all in your handwriting? A. Yes, sir, they are.

Q. 112. And they were made on September 28, 1935? A. Yes, sir. They were.

Mr. Adams: I offer these three pages of this notebook #17 collectively as Cunningham Exhibit 16 and ask that they be marked serially a, b and c.

(Received and marked.)

176 Q. 113. You previously referred I believe to this progress report for September, 1935? A. Yes, sir.

Q. 114. Is that your signature at the end of it? A. Yes, sir, it is.

Q. 115. When was that prepared? A. The first week of October, 1935.

Mr. Adams: I offer this progress report for September, 1935, as Cunningham Exhibit 17.

(Received and so marked.)

Q. 116. Is it correct to say that all of these progress reports were sent to a number of people in the organization, including always Mr. Taylor and Mr. Gage? A. Yes, sir.

Q. 117. I wish you would refer again to this notebook

#17 and identify for us any pages in here which include records of further work during October on this sodium sulfide from sodium amalgam process? A. On page 7, experiment No. 1411, dated October 1, 1935, gives the results of an experiment using the maple wooden trough. Also at the bottom of the page is given the rate of discharge of sodium amalgam. On page 9, experiment No. 1412.

Q. 118. Can you give us the date of the entries on page 9? A. I cannot give exactly the date of page 9 but it was between the period of October 1st and October 10, 1935.

Q. 119. Please continue? A. On page 11 of notebook #17 is given experiment No. 1413, dated October 10, 1935. At the top of the page is given an analysis of a stock solution of sodium sulfide which was to be used to prepare sodium polysulfide solutions for our future work. On the lower half of this same page is given the results of an experiment using the maple trough. On page 13, experiment No. 1414 is given the results of an experiment
177 which was a repeat of No. 1413, except that the temperature was raised to 80°. In these experiments using the maple trough much lower rates of discharge of sodium were being obtained—were obtained—than in other cases. This experiment was performed in an effort to see if increased temperature would remove this difficulty. The rate, however, was still low. It was later found that this lower rate was due to something that was being dissolved out of the wood by the sodium sulfide solution.

On page 15 of notebook #17, October 24, 1935, is given experiment No. 1415. In this experiment the maple trough was replaced with a glass discharge apparatus which had a surface of 30 square inches. This experiment shows that the rate in glass is as rapid as it was before and much faster than similar experiments in the maple trough.

Q. 119a. Now, these entries on pages 7, 9, 11, 13 and 15 were all made by you? In October of 1935? A. Yes, sir, they were.

Mr. Adams: I offer these pages from the notebook #17 collectively as Cunningham Exhibit 18 and ask that they be serially marked a, b, c, d and e.

(So marked.)

Q. 120. I hand you a document and will ask you to state what that is, if you know? A. This is a copy of my October progress report—October—1935, progress report.

Q. 121. Does it refer to this sodium sulfide from sodium amalgam process? A. Yes, sir, it does. The first paragraph refers to the exploratory work on the production of sodium sulfide from sodium amalgam and sulfur. The second and third paragraphs refer to work on densities of sodium sulfide solutions and also work on the rate
178 of solution of rhombic sulfur in solutions of sodium sulfide over a wide range of temperature and concentration and particle size of sulfur.

Q. 122. Do the last two paragraphs refer to this same process? A. Yes, sir. The fourth and fifth paragraphs refer to statements that a research report and a patent memorandum had been prepared based on this process.

Q. 123. Is this your signature at the end of this report? A. Yes, sir, it is.

Q. 124. And when was the report prepared? A. It was prepared the first week in November, 1935.

Mr. Adams: I offer this progress report for October, 1935, as Cunningham Exhibit 19.

(Received and marked.)

Q. 125. I hand you another document and ask you to tell us what it is if you can? A. This is the patent memorandum which I prepared at that time and which I mentioned in my October, 1935, monthly report.

Q. 126. That is, this is the same patent memorandum—? A. Based on the process of producing alkali metal sulfides from sodium amalgam and sulfur.

Q. 127. This document to which you are just referring is the patent memorandum to which reference is made in Cunningham Exhibit 19? A. Yes, sir.

Q. 128. When did you prepare this patent memorandum? A. I prepared it in October and signed it November 6, 1935.

Q. 129. I notice that there is a drawing attached to this patent memorandum. Can you say when that was prepared? A. This drawing was prepared—October 28, 1935.

Q. 130. Did you make that drawing? A. Yes, sir. I made the drawing based on the process.

179 Mr. Adams: I offer this patent memorandum dated November 6, 1935, as Cunningham Exhibit 20.

(Received and marked.)

Q. 131. Exhibit (Cunningham) No. 19 also referred to a research report. Is this the research report to which Exhibit 19 refers? A. Yes, sir, this is a research report on the process for the manufacture of sodium sulfide which I prepared in the month of October, 1935, and which is reported in my monthly report for October, 1935.

Q. 132. Does your signature appear on this report? A. Yes, sir, it does. I signed the report November 6, 1935.

Q. 133. And there is a drawing attached to this report. Can you say when that was prepared? A. Yes, sir. The drawing attached to this report was prepared by myself and signed October 28, 1935.

Q. 134. This drawing attached to Exhibit 20 is a copy of the drawing attached to the document to which you are now referring? A. Yes, sir, it is.

Mr. Adams: I offer this report which is marked at the upper lefthand corner of the first page "Report H-100", dated November 6, 1935, with the attached drawing as Cunningham Exhibit 21.

(So marked.)

Q. 135. I hand you what appears to be a letter from Mr. Taylor to Mr. Gage dated October 16, 1935, and will ask you to tell us whether or not you have ever received a copy of this letter? A. Yes, sir. I received a copy of this letter from Mr. Taylor to Mr. Gage on the subject of sodium sulfide.

Q. 136. Can you say when you received it? A. I received it shortly after October 16, 1935.

Q. 137. Was the work on the sodium sulfide from sodium amalgam process continued in accordance with the program outlined in that letter? A. Yes, sir, it was.
180 The first paragraph refers to a concrete reducing chamber. The second paragraph refers to metals which would be suitable to prepare the apparatus, the third paragraph refers to the possibility of working at higher temperatures—of preparing sodium sulfide at higher temperatures. The fourth paragraph refers to a search of the literature for information on the heats of the reaction and other data necessary for the pilot plant design.

Mr. Adams: I ask that this letter dated October 16, 1935, be marked for identification Cunningham Exhibit No. 22.

(So marked.)

Q. 138. I show you what appears to be a letter from Mr. Taylor to Mr. Gage dated January 29, 1936. Do you know anything about that letter? A. This is a letter from Mr. Taylor to Mr. Gage concerning the patent application which had been sent to Niagara Falls and reviewed by myself and Mr. Taylor. After making the review of this patent application, I made certain pencil comments which I gave to Mr. Taylor. In this letter he quotes to Mr. Gage my comments on the patent application.

Q. 139. By the time this letter was written you had reviewed the patent application and had approved it? A. Yes, sir.

Q. 140. And had executed it? A. Yes, sir.

Mr. Adams: I ask that this letter dated January 29, 1936, be marked for identification as Cunningham Exhibit 23.

(So marked.)

Mr. Adams: That is all for Mr. Cunningham.

GEORGE LEWIS CUNNINGHAM L. S.

Maurice Craig Taylor, a witness in behalf of George L. Cunningham, being first duly sworn, deposes and says, in answer to questions propounded by Mr. Raymond F. Adams, as follows:

Q. 1. Mr. Taylor, will you please state your name, age and residence? A. My name is Maurice Craig Taylor. My age is 43. I reside at 3040 Delancey Road, Niagara Falls, New York.

Q. 2. What is your present occupation? A. My present occupation is as a Director of Research for The Mathieson Alkali Works.

Q. 3. How long have you been employed by The Mathieson Alkali Works? A. I have been employed since January, 1919.

Q. 4. What was your position during the years 1934, 1935 and 1936? A. During these years my position was Assistant Director of Research at the laboratories of the Company in Niagara Falls, New York.

Q. 5. During Mr. Cunningham's testimony there were references to you and also to Mr. Gage and to a Mr. MacMullin. I wish you would tell us what your relations to Mr. Gage and to Mr. MacMullin were during that period, 1934, 1935 and 1936? A. The particular responsibility of the group whose work I direct is to devise or invent new processes or products and to carry through the preliminary research necessary to evaluate whatever inventions or ideas we may develop. This work is usually laboratory

work on a rather small scale. After the ideas have stood the tests of preliminary experimentation or other tests such as economic value, the proposition is usually turned over to Mr. MacMullin who is another Assistant Director of Research. His particular responsibility is to carry the process on into the small scale plant stage. Both Mr. MacMullin and myself are directly responsible to Mr.
182 Gage, who is Director of Research and Development
located in New York.

Q. 6. Then it would be fair to say that Mr. Gage is in general charge of research and development and that you are his assistant more particularly in charge of research and that Mr. MacMullin is the assistant directly in charge of development? A. That is correct.

Q. 7. So that in the normal course of events a process discovered or invented in your department would be carried through sufficient work to indicate probable economic merit and then would be turned over more particularly to Mr. MacMullin to carry on up to the plant scale? A. That is correct.

Q. 8. And you of course would continue to work with Mr. MacMullin after the thing moved under his jurisdiction? A. I would.

Q. 9. Now, Mr. Cunningham referred to three notebooks during his testimony and identified them as his red notebooks, numbers 15, 16 and 17. Were those notebooks of Mr. Cunningham's something peculiar to him or did they represent a type of record that was kept generally in the laboratory? A. They represent a type of record which was kept generally in the laboratory. Ever since I have been with the company it has been the procedure to enter all significant experimental data in these red bound notebooks of the type which Mr. Cunningham used in the experiments on sodium sulfide. These data are entered at the time the experiment is being carried on and the notebooks are carefully preserved for record.

Q. 10. And it was also true that you were familiar in your capacity as the Assistant Director of Research in the

laboratory at Niagara Falls with the work that Mr. Cunningham and others in the laboratory were doing as
183 it progressed? A. Yes, sir. It is the regular procedure for me at least once a week to familiarize myself with all the work that is going on in the laboratory so that I was undoubtedly familiar with Dr. Cunningham's experiments very shortly after the time he was carrying them out.

Q. 11. Can you say when his process for the production of sodium sulfide from sodium amalgam first came to your attention? A. His process for the production of sodium sulfide from sodium amalgam first came to my attention when he turned in his July, 1934, progress report.

Q. 12. Is this Exhibit 2 the progress report to which you have just referred? A. Yes, sir.

Q. 13. Were progress reports of this sort made regularly by the men in the laboratory? A. Yes, sir.

Q. 14. That was a matter of established routine and not just something that one man did? A. That is right. All of the major research men turn in a progress report covering the essentials of their work for the month. This report is always turned in the first week of the month following.

Q. 15. To whom do these reports go? A. These reports go to Mr. Gage, Mr. Hults, Mr. Vaughn, Mr. MacMullin and Mr. Taylor.

Q. 16. That is, yourself? A. That's myself.

Q. 17. Then this Exhibit 2 is a progress report that you received from Cunningham early in August of 1934? A. Yes, sir.

Q. 18. This Exhibit 6 is a progress report you received from Cunningham early in January of 1935? A. Yes, sir.

Q. 19. And can you say when you received this progress report which is Exhibit 9? A. I received this progress report the first week in June, 1935.

184 Q. 20. Now, when did you receive this progress report, Exhibit 11? A. I received this progress report the first week of July, 1935.

Q. 21. And when did you receive this Exhibit 14? A. I received this progress report the first week in September, 1935.

Q. 22. And this Exhibit 17. A. I received this progress report the first week of November, 1935.

Q. 23. I now hand you a document which has been marked for identification Cunningham Exhibit 10. I wish you would examine that and tell us what it is if you know? A. This exhibit is a summary of research which it was proposed be carried out on several new ideas and processes. On page 4 of this report there is a section on sodium sulfide. The work of Dr. Cunningham which I was familiar with, and which extended for almost a year prior to the writing of this research summary, had convinced me that the scientific principle on which Dr. Cunningham was working was sound and that his process was operable as he conceived it and had been carrying it out in the laboratory. It then seemed important to evaluate the process from an economic standpoint and the calculations included in this research summary, Exhibit 10, record an attempt to make such an economic evaluation. The new process which involved the reaction of sodium amalgam with sodium polysulfide was compared with the process for making sodium sulfide then in use, namely, the reduction of sodium sulfate with carbon. The comparison made the new process appear sufficiently favorable so that a definite recommendation was made to continue work on the new process using amalgam and Dr. Cunningham was instructed to continue his laboratory experiments on this new process.

Q. 23. Who prepared this research summary to which you have just been referring? A. I did.

185 Q. 24. And is this your signature at the end of it? A. Yes, sir.

Q. 25. Can you say when you prepared this research summary? A. I prepared this summary some time before June 11, 1935, on which date it was signed.

Mr. Adams: I offer this summary of research on uses for alkali and for sodium amalgam dated June 11, 1935, as Cunningham Exhibit 10.

(So marked.)

Q. 26. Can you tell us who received this document, Exhibit 10, or copies of it? A. This Exhibit 10 was sent to Mr. Gage. Mr. Cunningham was familiar with it as he assisted in the preparation of the section on sodium sulfide.

Q. 27. Well, the section on sodium sulfide was based on Mr. Cunningham's work. A. That is correct.

Q. 28. I hand you what appears to be a letter from Mr. Gage to you dated August 15, 1935, and a document marked "Market Research Report No. 33 SODIUM SULFIDE" dated August 13, 1935, and will ask you to tell us what you know about that letter and that document? A. In May, 1935, or earlier, Mr. Gage received in conferences with myself more information in regard to this sodium sulfide process and became so interested in it that he instructed Mr. Wittenberg to make a survey of the market possibilities of sodium sulfide. The results of that survey were included in a market research report No. 33 which was attached to Mr. Gage's letter of August 15, 1935.

Q. 29. And you did receive that letter and the attached market survey? A. That is correct.

Q. 30. And this letter dated August 15, 1935, is the letter that you received from Mr. Gage? A. Yes, sir.

186 Q. 31. And this market research report No. 33 is the market survey that accompanied that letter? A. That is correct.

Mr. Adams: I offer this letter from Mr. Gage to Mr. Taylor dated August 15, 1935, as Cunningham Exhibit No. 24.

(So marked.)

Q. 32. This is Mr. Gage's signature at the end of the letter. You recognize that? A. Yes, sir, I do.

Mr. Adams: I offer this Market Research Report No. 33, dated August 13, 1935, which Mr. Taylor received with Cunningham Exhibit 24 as Cunningham Exhibit No. 25.

(So marked.)

Q. 33. Now, I wish you would tell us what you did after you had had a chance to go over this Market Survey, Exhibit No. 25? A. At that particular date Dr. Cunningham was away on vacation and I prepared a letter dated August 17, 1935, which outlined definite work which I wished Dr. Cunningham to carry out on his return on the process for making sodium sulfide from amalgam.

Q. 34. This letter marked Cunningham Exhibit 12 for identification is the letter to which you just referred? A. Yes, sir.

Mr. Adams: I offer the letter marked for identification Cunningham Exhibit 12, as Cunningham Exhibit 12.

(So marked.)

187 Q. 35. I note that this letter, Exhibit 12, is addressed to Mr. MacMullin and there is a notation the initials "cc. G. L. C." Can you tell us who received that letter or copies of it? A. I had plans at that time for going on vacation myself and it is my custom in such a case to ask Mr. MacMullin to take up some duties involved in the direction of research which I would otherwise do myself so that I sent this letter to him and also sent a copy to Mr. Cunningham.

Q. 36. I hand you another document and will ask you to tell us what it is, if you can? A. This is a letter from myself to Mr. Hackenheimer, who is Accountant for the Company at Niagara Falls, in which letter I ask that a new charge account be instituted to cover work on this new process for making sodium sulfide from amalgam. Previous to this time the work which Mr. Cunningham had been doing had been charged to a charge account which is designated as exploratory research. When any work which is going on under this account develops to a point where a considerable expenditure is involved, the custom is to set up a separate account to cover such work.

Mr. Adams: I offer this letter from Mr. Taylor to Mr. Hackenheimer, dated September 7, 1935, as Cunningham Exhibit 26.

(So marked.)

Q. 37. Was such a separate account set up in response to your request? A. Yes, sir, it was.

Q. 38. I have here, marked for identification, Exhibit No. 22—what appears to be a letter from you to Mr. Gage dated October 16, 1935. Will you tell us what that is? A. As a result of the increased amount of work which had been going on since August, a conference was held between Mr. MacMullin, Dr. Cunningham and myself in which 188 a definite program for future research was agreed upon. This letter to Mr. Gage prepared by myself gives a summary of the program which was to be carried out.

Q. 39. And was the work carried out along the general lines outlined in this letter? A. Yes, sir, it was.

Q. 40. This is your signature at the bottom of the letter? A. Yes, sir, it is.

Q. 41. And can you say when the letter was written? A. The letter was written on or before October 16, 1935.

Mr. Adams: I offer this letter marked Cunningham Exhibit 22 for identification as Cunningham Exhibit 22.

Q. 42. I hand you a document marked Cunningham Exhibit No. 20. I wish you would tell us what you know about that document? A. This is a patent memorandum which was prepared by Mr. Cunningham and covers essential information for the preparation of a patent application on the process for making sodium sulfide from sodium amalgam and sodium polysulfide solution, or sodium sulfide and sulfur.

Q. 43. This came to you from Mr. Cunningham? A. Yes, sir.

Q. 44. And what did you do with it? A. I reviewed it carefully and then sent it on to Mr. Gage with my comments.

Q. 45. I hand you a document marked Cunningham Exhibit 21. Is this your signature—M. C. Taylor—which appears on the last page of this document in front of the drawing page numbered 6? A. Yes, sir, it is.

Q. 46. I wish you would tell us how your signature came to be affixed to that document. A. It is our custom to prepare a detailed research report on the various
189 subjects which we may be doing research on after the work has proceeded to a point where such a report can be written. This report includes the significant laboratory experiments which Mr. Cunningham had carried out on his new process.

Q. 47. Can you say when you received this report? A. I received this report between November 6, 1935 and December 6, 1935.

Q. 48. You signed it on December 6, 1935? A. That is right.

Q. 49. I hand you another document and I wish you would tell us what it is and what the occasion of writing it was? A. After the patent application had been prepared, it was returned to Mr. Cunningham and myself for whatever comments we might have to make. This letter includes these comments and was prepared by myself and sent to Mr. Gage.

Q. 50. And the executed application for patent in Mr. Cunningham's name went to Mr. Gage along with this letter? A. That is correct.

Mr. Adams: I offer this letter to which Mr. Taylor has just referred previously marked Cunningham Exhibit 23 for identification as Cunningham Exhibit No. 23. That is all for Mr. Taylor.

(Whereupon adjournment for lunch.)

MAURICE CRAIG TAYLOR L. S.

(Depositions resumed 2:05 P. M., November 4, 1937.)

Present:

Mr. Raymond F. Adams, of PENNIE, DAVIS, MARVIN & EDMONDS, counsel for Cunningham.

Robert B. Wittenberg, a witness in behalf of George L. Cunningham, being first duly sworn, deposes and says, in answer to questions propounded by Mr. Raymond F. Adams, as follows:

Q. 1. Please state your full name, your age and your residence? A. Robert Bringhurst Wittenberg; 35, residence, New Rochelle, New York.

Q. 2. What is your present occupation? A. Employed in the Development Department of Mathieson Alkali Works in charge of marketing research and commercial investigations.

Q. 3. How long have you been so employed? A. Since April, 1932.

Q. 4. I hand you a document which is marked Cunningham Exhibit No. 25 and will ask you to tell us what it is, if you know? A. That is a market research report on sodium sulfide which I prepared in 1935 and submitted it to Mr. Gage on August 13th.

Q. 5. August 13, 1935? A. That is correct.

Q. 6. Does your signature appear on this document? A. Yes, sir. In the summary.

Q. 7. When did the work on which that survey is based begin? A. That began some time during the period between May, 1935 and July 5, 1935.

Q. 8. Will you tell us how you fix that date? A. From September, 1934, until April 12, 1935, I was occupied with another matter. My formal report on that was submitted on April 12th, and there was approximately 191 four or five weeks additional work on that subject which took practically all of my time which brings us up to around the 22nd of May—somewhere in that neighborhood.